

SUPPLEMENTARY TABLE S1. Summary of environment variables used in the study.

Category	Variable name	Source
Climate factor	≥0 °C annual accumulated temperature	http://www.resdc.cn
	≥10 °C annual accumulated temperature	
	Aridity	
	Index of Moisture	
	Average annual precipitation	
	Average annual temperature	
Geographical factor	Landform	http://www.geodata.cn
	Land use	http://www.resdc.cn
	Elevation	
	Sand	
	Silt	
Clay		
Socioeconomic factor	Gross domestic product	http://www.resdc.cn
	Density of population	

SUPPLEMENTARY TABLE S2. Summary of niche models used in the study.

Classification	Model name
Environmental envelope theory	Surface range envelope
Statistical regression algorithm	Generalized linear model
	Generalized additive model
	Multivariate adaptive regression spline
Statistical classification algorithm	Generalized boosted model
	Classification tree analysis
	Flexible discriminant analysis
Machine learning algorithm	Artificial neural networks
	Random forest
	Maximum entropy

SUPPLEMENTARY TABLE S3. Performance evaluation indicators results of 10 niche models used in the study.

Model	TSS (mean ± SD)	AUC (mean ± SD)
GLM	0.868 ± 0.057	0.947 ± 0.042
GBM	0.950 ± 0.007	0.996 ± 0.001
GAM	0.926 ± 0.008	0.990 ± 0.001
CTA	0.945 ± 0.009	0.980 ± 0.005
ANN	0.813 ± 0.056	0.930 ± 0.032
SRE	0.651 ± 0.018	0.825 ± 0.008
MARS	0.846 ± 0.251	0.946 ± 0.133
FDA	0.914 ± 0.015	0.983 ± 0.006
RF	0.973 ± 0.004	0.998 ± 0.001
MaxEnt	0.815 ± 0.023	0.915 ± 0.023

Abbreviation: TSS=True skill statistics; AUC=Area under the curve; SD=Standard deviation; GLM=Generalized linear model; GBM=Generalized boosted model; GAM=Generalized additive model; CTA=Classification tree analysis; ANN=Artificial neural networks; SRE=Surface range envelope; MARS=Multivariate adaptive regression spline; FDA=Flexible discriminant analysis; RF=Random forest; MaxEnt=Maximum entropy.

SUPPLEMENTARY TABLE S4. Importance percentage (%) of environmental variables of 10 niche models used in the study.

Model	GLM	GBM	GAM	CTA	ANN	SRE	MARS	FDA	RF	MaxEnt
AAT	22.02	34.93	29.21	35.22	13.02	11.88	43.54	25.83	27.62	19.01
AAP	17.70	18.61	15.72	24.72	16.44	11.54	12.57	26.11	10.35	5.75
IM	18.45	9.73	8.24	0.34	31.16	10.03	17.78	15.69	4.75	9.11
LF	7.28	24.28	13.29	12.15	6.78	10.68	5.31	8.33	15.85	7.13
GDP	1.07	5.62	0.03	15.76	2.16	9.71	2.57	8.40	16.49	9.36
AR	6.32	1.22	5.53	0.21	11.17	9.17	5.71	2.92	0.90	11.02
EL	10.76	0.03	2.07	0.60	10.73	4.75	0.88	1.77	4.75	9.04
AAT0	8.61	0.48	5.56	2.53	0.53	6.39	2.79	6.08	10.29	9.18
DP	1.82	0.45	0.22	0.12	4.84	0.68	1.33	1.35	3.94	6.19
LD	0.51	1.54	10.25	5.36	0.61	8.82	3.93	1.42	1.42	1.35
Sand	0.81	1.81	4.66	2.49	0.39	6.88	0.90	0.80	2.23	1.30
AAT10	2.63	0.49	1.42	0.07	0.38	3.21	1.45	0.87	0.40	7.05
Silt	0.09	0.37	3.69	0.03	0.74	5.38	0.50	0.38	0.48	0.35
Clay	1.94	0.43	0.11	0.40	1.04	0.88	0.74	0.03	0.54	4.18

Abbreviation: AAT=Average annual temperature; AAP=Average annual precipitation; IM=Index of moisture; LF=Landform; GDP=Gross domestic product; AR=Aridity; EL=Elevation; DP=Density of population; LD=Land use; AAT0,  $\geq 0$  °C annual accumulated temperature; AAT10,  $\geq 10$  °C Annual accumulated temperature. GLM=Generalized linear model; GBM=Generalized boosted model; GAM=Generalized additive model; CTA=Classification tree analysis; ANN=Artificial neural networks; SRE=Surface range envelope; MARS=Multivariate adaptive regression spline; FDA=Flexible discriminant analysis; RF=Random forest; MaxEnt=Maximum entropy.