

Supplementary Materials

Table S1. List of 212 presence records of *Liriodendron chinense* at a spatial resolution of 10 arc-minutes.

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	100.9166821	23.91667122	72	109.4166828	24.41667126	143	115.4166832	31.75000518
2	101.5833488	24.9166713	73	109.5833494	30.25000506	144	115.7500166	31.08333846
3	102.7500156	25.08333798	74	109.5833494	29.9166717	145	115.7500166	27.75000486
4	102.7500156	23.08333782	75	109.5833494	29.25000498	146	115.9166833	29.75000502
5	102.7500156	22.75000446	76	109.7500161	32.08333854	147	115.9166833	29.58333834
6	102.9166822	30.41667174	77	109.7500161	30.08333838	148	115.9166833	28.75000494
7	103.4166823	23.41667118	78	109.7500161	29.75000502	149	116.08335	29.58333834
8	103.583349	31.08333846	79	109.7500161	29.58333834	150	116.2500166	40.08333918
9	103.583349	28.41667158	80	109.9166828	31.41667182	151	116.2500166	39.9166725
10	103.9166823	36.5833389	81	109.9166828	30.58333842	152	116.2500166	39.58333914
11	103.9166823	28.75000494	82	109.9166828	30.41667174	153	116.2500166	27.4166715
12	104.083349	37.58333898	83	110.0833495	30.25000506	154	116.4166833	39.9166725
13	104.083349	32.58333858	84	110.0833495	29.75000502	155	116.58335	40.41667254
14	104.083349	30.58333842	85	110.0833495	28.91667162	156	116.58335	40.25000586
15	104.083349	28.75000494	86	110.0833495	25.25000466	157	116.58335	39.9166725
16	104.083349	28.41667158	87	110.2500162	30.08333838	158	116.7500167	39.9166725
17	104.083349	23.41667118	88	110.2500162	29.9166717	159	116.7500167	35.41667214
18	104.2500157	28.91667162	89	110.2500162	29.58333834	160	116.9166834	27.08333814
19	104.2500157	23.41667118	90	110.2500162	25.25000466	161	117.08335	40.25000586
20	104.583349	28.08333822	91	110.4166828	31.41667182	162	117.2500167	31.91667186
21	104.7500157	30.91667178	92	110.4166828	31.25000514	163	117.2500167	29.25000498
22	104.7500157	23.08333782	93	110.4166828	30.91667178	164	117.5833501	28.08333822
23	104.9166824	23.2500045	94	110.4166828	25.91667138	165	117.7500168	30.25000506
24	105.0833491	24.41667126	95	110.4166828	25.08333798	166	117.7500168	28.08333822
25	105.4166824	28.91667162	96	110.5833495	31.41667182	167	117.7500168	27.91667154
26	105.4166824	28.08333822	97	110.5833495	29.41667166	168	117.9166834	30.91667178
27	105.7500158	28.2500049	98	110.5833495	26.08333806	169	117.9166834	27.91667154
28	105.9166825	28.41667158	99	110.5833495	25.58333802	170	117.9166834	27.58333818
29	105.9166825	24.9166713	100	110.7500162	31.25000514	171	117.9166834	26.91667146
30	106.2500158	29.25000498	101	110.7500162	30.25000506	172	117.9166834	26.08333806
31	106.2500158	29.0833383	102	110.7500162	26.08333806	173	118.0833501	30.25000506
32	106.2500158	25.25000466	103	110.7500162	25.7500047	174	118.0833501	29.75000502
33	106.5833492	26.41667142	104	110.9166829	31.08333846	175	118.0833501	27.75000486
34	106.7500159	31.91667186	105	110.9166829	30.08333838	176	118.2500168	29.75000502
35	106.7500159	27.08333814	106	110.9166829	29.58333834	177	118.2500168	26.5833381
36	106.7500159	26.91667146	107	110.9166829	26.5833381	178	118.2500168	25.7500047

37	106.7500159	26.5833381	108	111.0833496	29.75000502	179	118.5833502	36.08333886
38	106.7500159	26.41667142	109	111.0833496	26.41667142	180	118.5833502	29.9166717
39	107.0833492	28.91667162	110	111.0833496	25.41667134	181	118.7500168	32.08333854
40	107.2500159	28.91667162	111	111.2500162	26.41667142	182	118.7500168	27.91667154
41	107.2500159	28.58333826	112	111.5833496	25.58333802	183	118.9166835	32.08333854
42	107.2500159	28.2500049	113	111.7500163	27.75000486	184	118.9166835	30.08333838
43	107.2500159	28.08333822	114	111.916683	26.75000478	185	118.9166835	29.58333834
44	107.5833493	28.91667162	115	111.916683	25.25000466	186	118.9166835	28.41667158
45	107.750016	28.2500049	116	112.416683	35.25000546	187	119.0833502	30.41667174
46	107.9166826	30.25000506	117	112.416683	31.25000514	188	119.0833502	28.58333826
47	107.9166826	25.41667134	118	112.5833497	27.25000482	189	119.0833502	28.41667158
48	108.0833493	28.41667158	119	112.7500164	27.25000482	190	119.0833502	28.08333822
49	108.0833493	27.25000482	120	112.7500164	27.08333814	191	119.2500169	28.2500049
50	108.0833493	25.41667134	121	112.916683	31.08333846	192	119.2500169	27.91667154
51	108.250016	26.41667142	122	112.916683	28.2500049	193	119.4166836	33.08333862
52	108.4166827	30.41667174	123	112.916683	28.08333822	194	119.4166836	30.41667174
53	108.4166827	28.58333826	124	113.0833497	27.91667154	195	119.4166836	30.25000506
54	108.4166827	27.75000486	125	113.2500164	35.25000546	196	119.4166836	29.41667166
55	108.750016	32.25000522	126	113.2500164	26.25000474	197	119.5833502	30.25000506
56	108.750016	30.25000506	127	113.2500164	24.75000462	198	119.5833502	27.91667154
57	108.750016	29.58333834	128	113.2500164	23.08333782	199	119.7500169	30.25000506
58	108.750016	28.91667162	129	113.7500164	28.2500049	200	119.7500169	29.41667166
59	108.750016	27.91667154	130	114.0833498	31.75000518	201	119.9166836	30.08333838
60	108.9166827	34.25000538	131	114.0833498	28.41667158	202	119.9166836	29.0833383
61	108.9166827	32.25000522	132	114.0833498	26.5833381	203	119.9166836	27.75000486
62	108.9166827	28.2500049	133	114.2500165	30.58333842	204	119.9166836	27.25000482
63	108.9166827	28.08333822	134	114.2500165	28.75000494	205	120.0833503	30.25000506
64	108.9166827	23.58333786	135	114.4166832	32.08333854	206	120.0833503	29.25000498
65	109.0833494	29.75000502	136	114.4166832	30.58333842	207	120.0833503	28.2500049
66	109.0833494	28.41667158	137	114.4166832	27.91667154	208	120.250017	30.25000506
67	109.0833494	28.08333822	138	114.5833498	29.58333834	209	120.250017	30.08333838
68	109.0833494	26.08333806	139	114.5833498	28.58333826	210	120.4166836	36.08333886
69	109.0833494	25.41667134	140	114.7500165	27.75000486	211	121.5833504	38.91667242
70	109.2500161	29.9166717	141	114.9166832	31.5833385	212	126.7500175	44.0833395
71	109.4166828	29.9166717	142	114.9166832	29.25000498			

Table S2. List of 23 environmental variables used in this study.

Category	Variable	Description	Unit
Climate	Bio1	Annual Mean Temperature	°C
	Bio2	Mean Diurnal Range (Mean of monthly (max. temp–min. temp))	°C
	Bio3	Isothermality (Bio2/Bio7) (×100)	–
	Bio4	Temperature Seasonality (standard deviation × 100)	°C
	Bio5	Maximum Temperature of Warmest Month	°C
	Bio6	Minimum Temperature of Coldest Month	°C
	Bio7	Temperature Annual Range (Bio5–Bio6)	°C
	Bio8	Mean Temperature of Wettest Quarter	°C
	Bio9	Mean Temperature of Driest Quarter	°C
	Bio10	Mean Temperature of Warmest Quarter	°C
	Bio11	Mean Temperature of Coldest Quarter	°C
	Bio12	Annual Precipitation	mm
	Bio13	Precipitation of Wettest Month	mm
	Bio14	Precipitation of Driest Month	mm
	Bio15	Precipitation Seasonality (Coefficient of Variation)	–
	Bio16	Precipitation of Wettest Quarter	mm
	Bio17	Precipitation of Driest Quarter	mm
	Bio18	Precipitation of Warmest Quarter	mm
	Bio19	Precipitation of Coldest Quarter	mm
Topography	Elevation		m
	Slope		°
	Northness		–
	Eastness		–

Table S3. Pearson correlation coefficients (*r*) among the 19 bioclimate variables (layers) calculated by the Band Collection Statistics tool in ArcGIS 10.3.

Variable	Bio1	Bio2	Bio3	Bio4	Bio5	Bio6	Bio7	Bio8	Bio9	Bio10	Bio11	Bio12	Bio13	Bio14	Bio15	Bio16	Bio17	Bio18
e	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	
Bio2	-																	
	0.67																	
Bio3	-																	
	0.12	0.31																
Bio4	-		-															
	0.35	0.40	0.71															
Bio5		-	-															
	0.81			0.25														
		0.38	0.53															
Bio6			-															
	0.92		0.12		0.53													
		0.76		0.67														

[illegible]

Table S4. Pearson correlation coefficients (r) among the four topographical variables (layers) calculated by the Band Collection Statistics tool in ArcGIS 10.3.

Note: If two variables were highly correlated ($|r| \geq 0.7$), only one of them was selected in the MaxEnt model.

Table S5. Pearson correlation coefficients (r) among the 19 bioclimate variables (points) calculated by the cor command in R.

Variable	Bio1	Bio2	Bio3	Bio4	Bio5	Bio6	Bio7	Bio8	Bio9	Bio10	Bio11	Bio12	Bio13	Bio14	Bio15	Bio16	Bio17	Bio18	Bio19
e	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8		
Bio2	-																		
	0.33																		
Bio3	0.19	0.48																	
Bio4	-		-																
		0.33																	
	0.45		0.65																
Bio5		-	-																
	0.65			0.37															
		0.06	0.37																
Bio6		-		-															
	0.88		0.26		0.27														
		0.58		0.76															
Bio7	-		-			-													
		0.54		0.97	0.31														
	0.50		0.47			0.83													
Bio8			-																
	0.40	0.11		0.18	0.52	0.15	0.15												
			0.01																
Bio9		-		-			-												
	0.91		0.30		0.40	0.91		0.14											
		0.39		0.64			0.66												
Bio10		-	-																
	0.73			0.28	0.98	0.38	0.19	0.55	0.49										
		0.16	0.33																
Bio11		-		-			-												
	0.91		0.42		0.28	0.98		0.18	0.94	0.38									
		0.40		0.78			0.81												
Bio12		-	-	-			-	-											
	0.49				0.21	0.58			0.63	0.28	0.53								
		0.57	0.13	0.36			0.45	0.29											
Bio13		-		-			-	-											
	0.44		0.13		0.16	0.42			0.55	0.24	0.45	0.80							
		0.20		0.29			0.32	0.14											
Bio14		-	-	-			-	-											
	0.47				0.48	0.41			0.55	0.52	0.36	0.85	0.59						
		0.50	0.38	0.02			0.13	0.22											
Bio15	-				-	-		-											
		0.69	0.38	0.21			0.33	0.24	-0.29	-0.38	-0.69	-0.18	-0.77						
	0.37				0.25	0.48		0.47											
Bio16		-		-			-	-											
	0.53		0.17		0.13	0.57			0.65	0.21	0.59	0.88	0.94	0.63	-0.31				
		0.33		0.45			0.49	0.21											
Bio17		-	-	-			-	-											
	0.48				0.50	0.39			0.54	0.53	0.35	0.85	0.60	0.99	-0.75	0.63			
		0.45	0.36	0.01			0.10	0.21											
Bio18		-		-	-		-												
	0.40		0.33			0.55		0.00	0.52	-0.02	0.56	0.68	0.78	0.29	-0.14	0.82	0.29		
		0.32		0.58	0.13		0.62												
Bio19		-	-	-			-	-											
	0.48				0.49	0.38			0.57	0.52	0.36	0.85	0.67	0.97	-0.69	0.68	0.98	0.31	
		0.39	0.31	0.01			0.09	0.23											

Note: If two variables were highly correlated ($|r| \geq 0.7$), only one of them was selected in the MaxEnt model.

Table S6. Pearson correlation coefficients (r) among the four topographical variables (points) calculated by the cor command in R.

Variable	Elevation	Slope	Northness
Slope	0.28		
Northness	-0.05	-0.03	
Eastness	-0.01	-0.10	-0.02

Note: If two variables were highly correlated ($|r| \geq 0.7$), only one of them was selected in the MaxEnt model.

Table S7. Proportion (%) of the variance explained by the first three principal components (PC1–3) in a principal components analysis of the 212 *Liriodendron chinense* occurrence points.

Component	Variance (%)	Cumulative (%)
PC1	47.2	47.2
PC2	21.5	68.7
PC3	14.6	83.2

Table S8. Loading factors of the environmental variables used in the principal component analysis.

Variable	PC1	PC2	PC3
Bio1	0.271	0.013	-0.342
Bio2	-0.196	0.034	-0.139
Bio3	0.013	0.401	-0.129
Bio4	-0.178	-0.404	-0.013
Bio5	0.130	-0.335	-0.358
Bio6	0.284	0.164	-0.182
Bio7	-0.206	-0.356	-0.027
Bio8	-0.011	-0.062	-0.509
Bio9	0.298	0.090	-0.185
Bio10	0.161	-0.304	-0.365
Bio11	0.276	0.193	-0.223
Bio12	0.298	-0.059	0.230
Bio13	0.243	0.017	0.142
Bio14	0.262	-0.253	0.164
Bio15	-0.219	0.154	-0.165
Bio16	0.277	0.062	0.150
Bio17	0.260	-0.258	0.157
Bio18	0.218	0.210	0.101
Bio19	0.261	-0.246	0.156

PC is the principal component calculated from principal component analysis on 19 bioclimatic variables of 212 *Liriodendron chinense* occurrence points. The description of variables is indicated in Table S2. Highest loading values are highlighted in bold face.

Table S9. Predicted changes in the suitable habitat area ($\times 10^5 \text{ km}^2$) of *Liriodendron chinense* under different climate change scenarios in China.

Future Climate Scenario/Year Combination	Unchanged	Loss	Gain	Total Change (= Gain – Loss) ¹
RCP2.6–2050	21.47	0.75	2.23	1.49
RCP4.5–2050	21.05	1.16	2.69	1.53
RCP6.0–2050	21.46	0.75	2.50	1.74
RCP8.5–2050	21.07	1.14	3.07	1.93
RCP2.6–2070	21.39	0.82	2.46	1.64
RCP4.5–2070	20.68	1.53	2.45	0.92
RCP6.0–2070	21.09	1.12	2.59	1.47
RCP8.5–2070	21.06	1.15	4.35	3.20

¹Positive values indicate suitable climatic habitat area expansions.

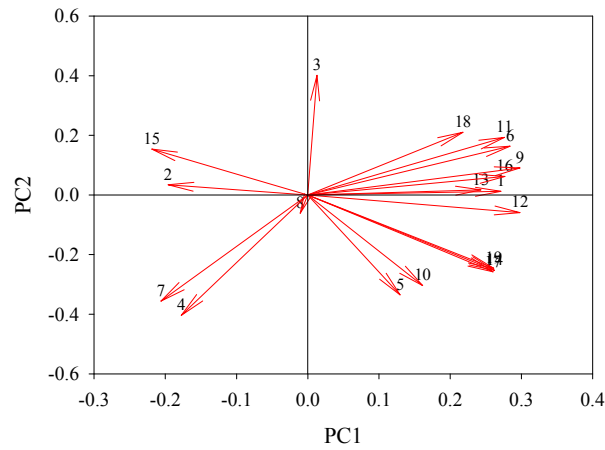


Figure S1. Bioclimatic space for *Liriodendron chinense* across its 212 occurrence points. The first two principal components (PC1–2) are plotted. The numbers beside arrows indicate the 19 bioclimatic variables.

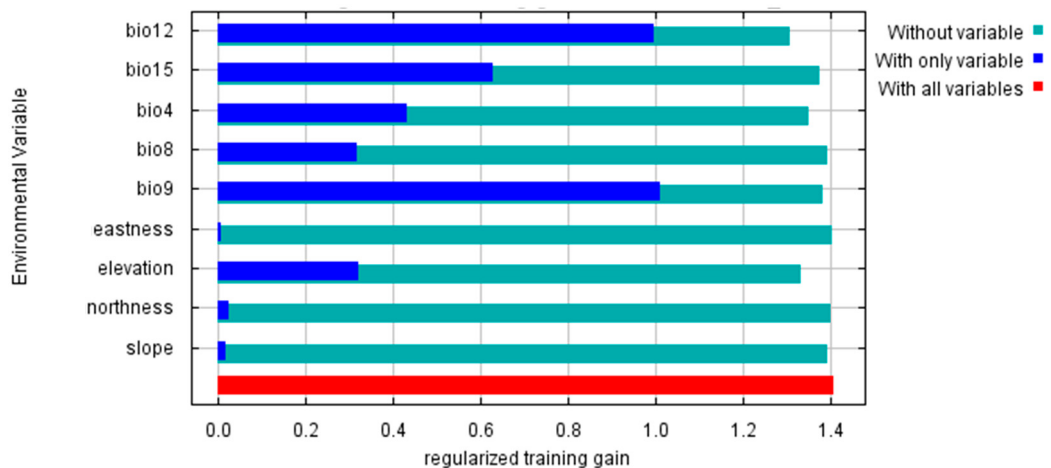


Figure S2. Results of the jackknife test of variable importance in modeling the spatial distribution of *Liriodendron chinense* in China. Values shown are averages over five replicates runs. The regularized training gain describes how much better the MaxEnt distribution fits the presence data compared to a uniform distribution. The dark blue bars indicate the gain over using each variable in isolation; the light blue bars indicate the gain lost by removing the single variable from the full model, and the red bar indicates the gain using all of the variables.

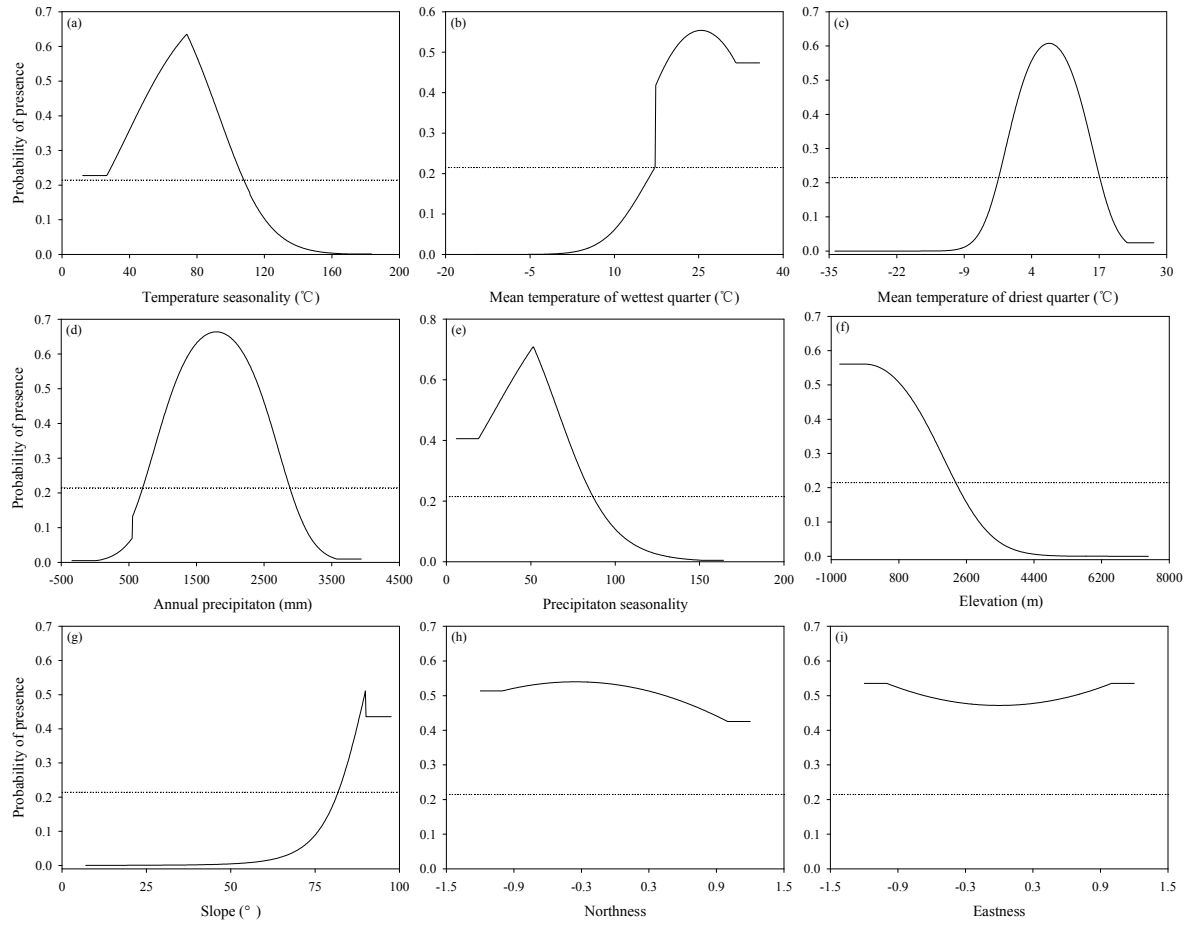


Figure S3. The response curves of nine variables to the climatic habitat suitability of *Liriodendron chinense*. (a) Temperature seasonality, (b) mean temperature of wettest quarter, (c) mean temperature of driest quarter, (d) annual precipitation, (e) precipitation seasonality, (f) elevation, (g) slope, (h) northness, and (i) eastness. Dotted lines represent the threshold probability (0.215) indicative of species presence.

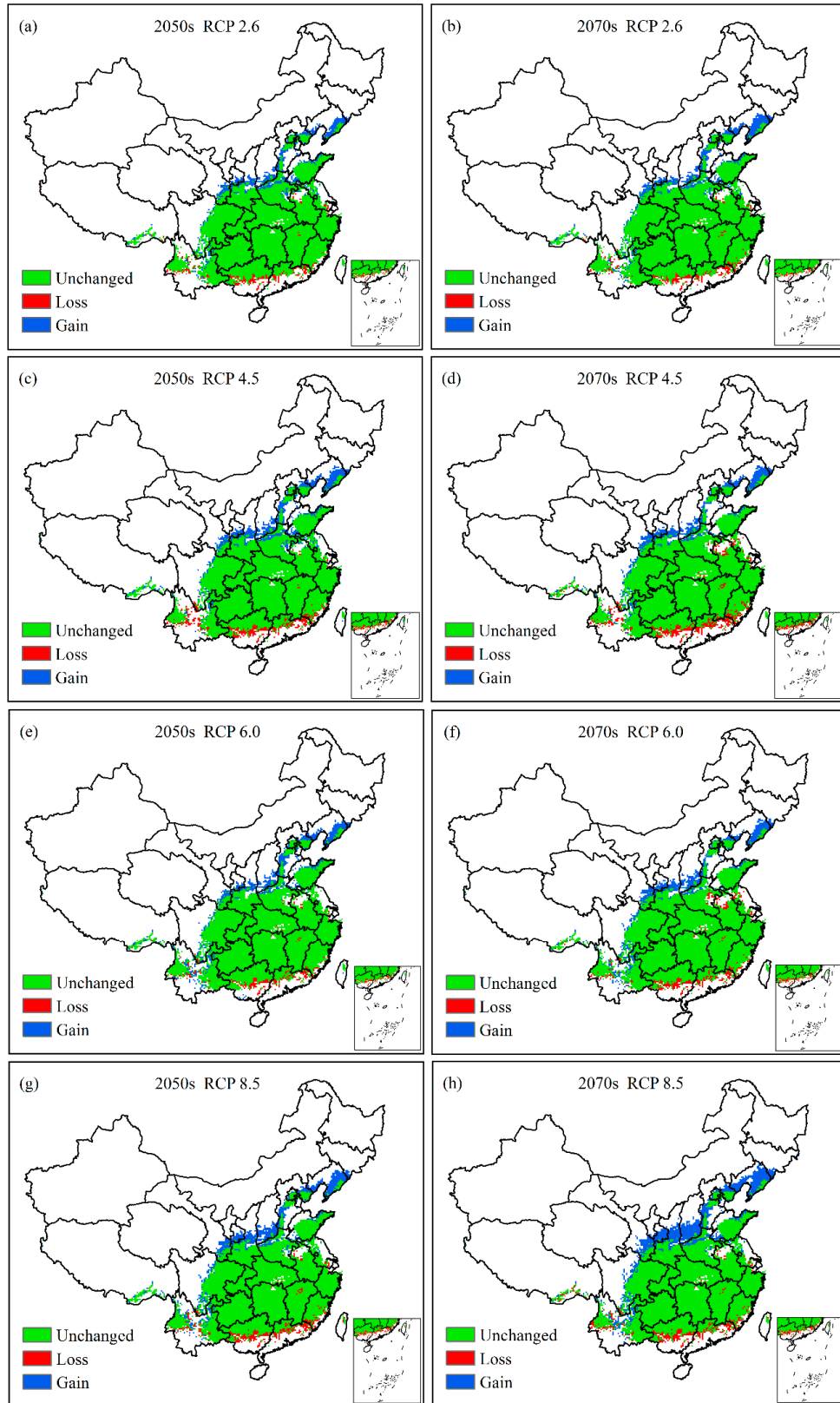


Figure S4. Changes in the suitable climatic habitat of *Liriodendron chinense* under different climate change scenarios in China. (a) 2050s in the RCP 2.6 climate scenario, (b) 2070s in the RCP 2.6 climate scenario, (c) 2050s in the RCP 4.5 climate scenario, (d) 2070s in the RCP 4.5 climate scenario, (e) 2050s in the RCP 6.0 climate scenario, (f) 2070s in the RCP 6.0 climate scenario, (g) 2050s in the RCP 8.5 climate scenario, and (h) 2070s in the RCP 8.5 climate scenario.

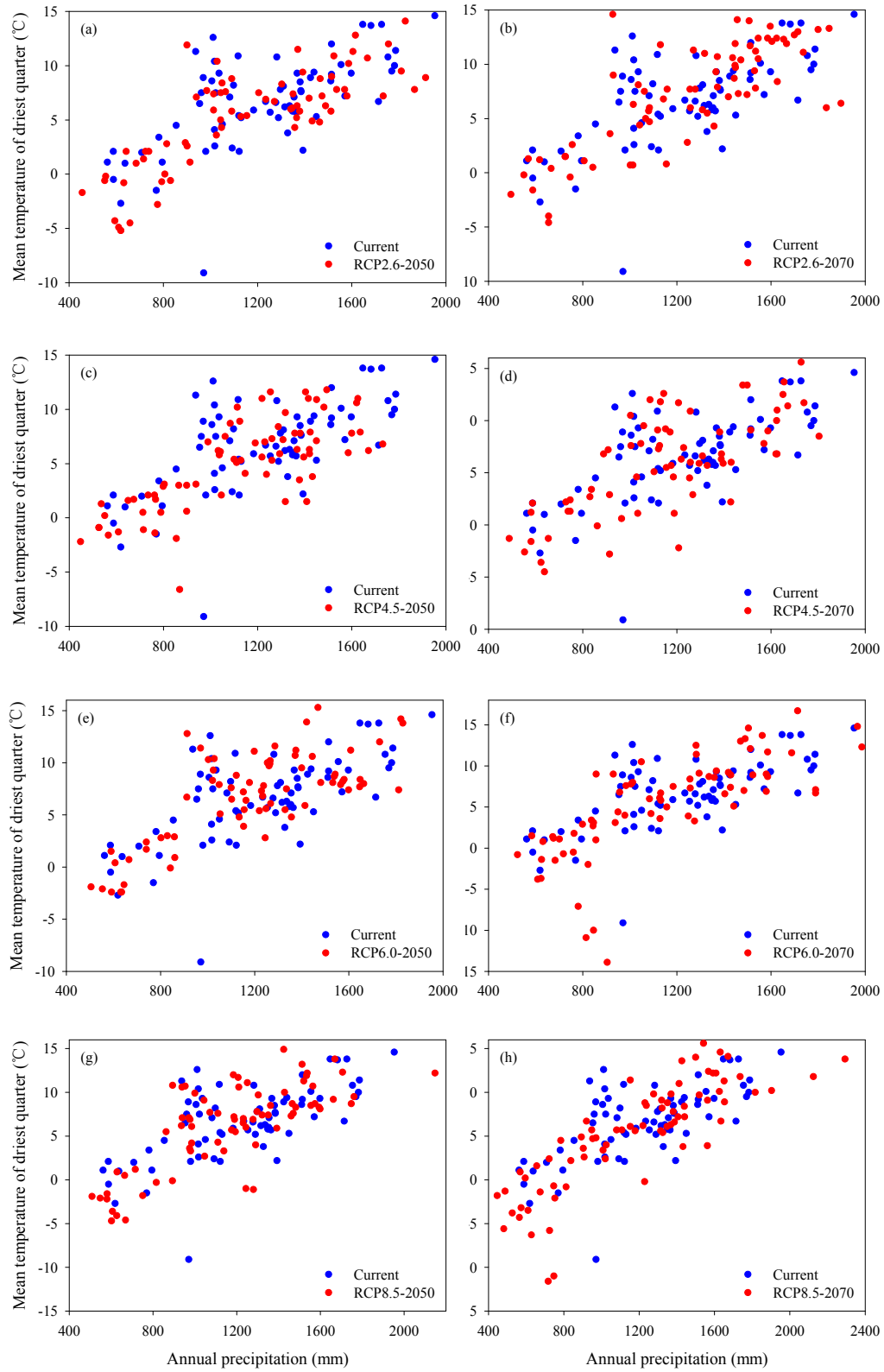


Figure S5. Annual precipitation and mean temperature of the driest quarter suitable for the spatial distribution of *Liriodendron chinense* under current and different future climate change scenarios in China. (a) 2050s in the RCP 2.6 climate scenario, (b) 2070s in the RCP 2.6 climate scenario, (c) 2050s in the RCP 4.5 climate scenario, (d) 2070s in the RCP 4.5 climate scenario, (e) 2050s in the RCP 6.0 climate scenario, (f) 2070s in the RCP 6.0 climate scenario, (g) 2050s in the RCP 8.5 climate scenario, and (h) 2070s in the RCP 8.5 climate scenario.