Supplementary Materials

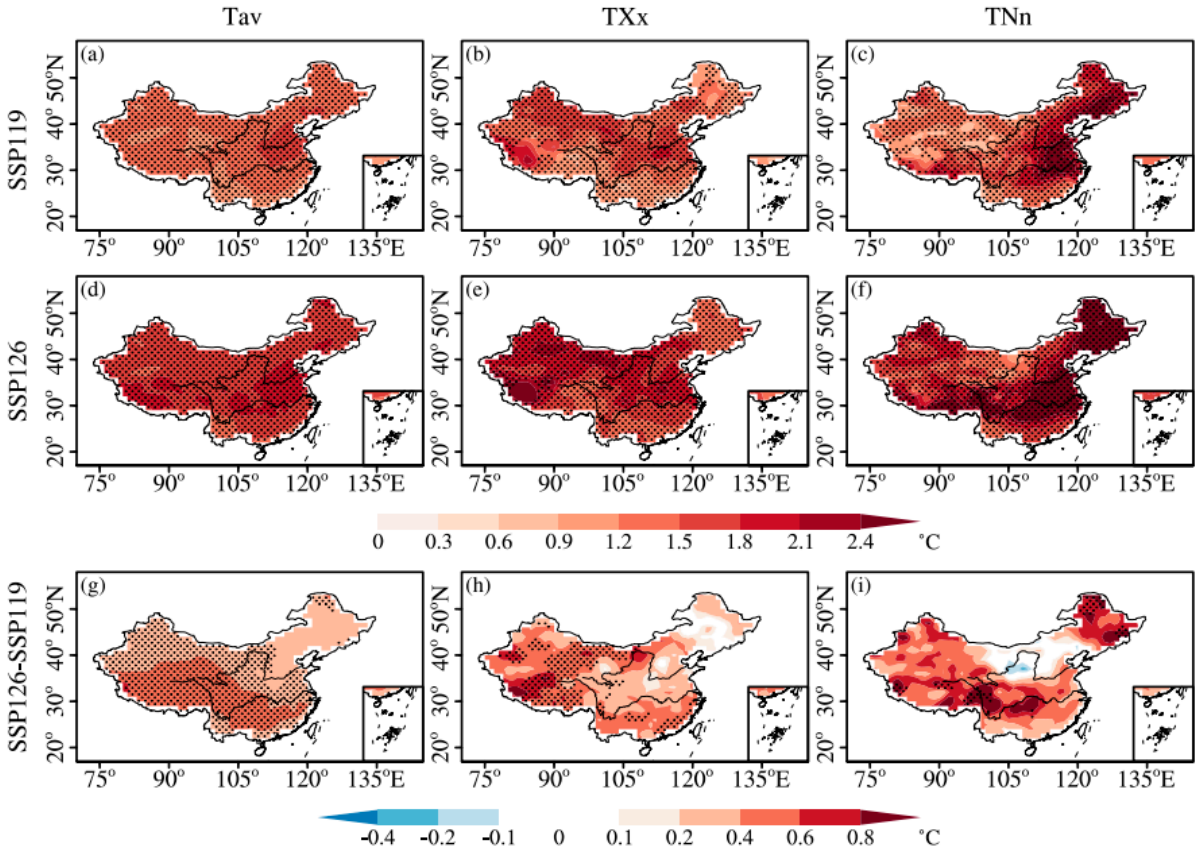


Figure S1. Projected changes, relative to 1995–2014, in Tav, TXx, and TNn under carbon neutrality in SSP1-1.9 (a-c) and SSP1-2.6 (d-f) and their differences (g-i, SSP1-2.6 minus SSP1-1.9) from MME. Dotted regions represent significant changes at the 95% confidence level based on the Student's *t* test.

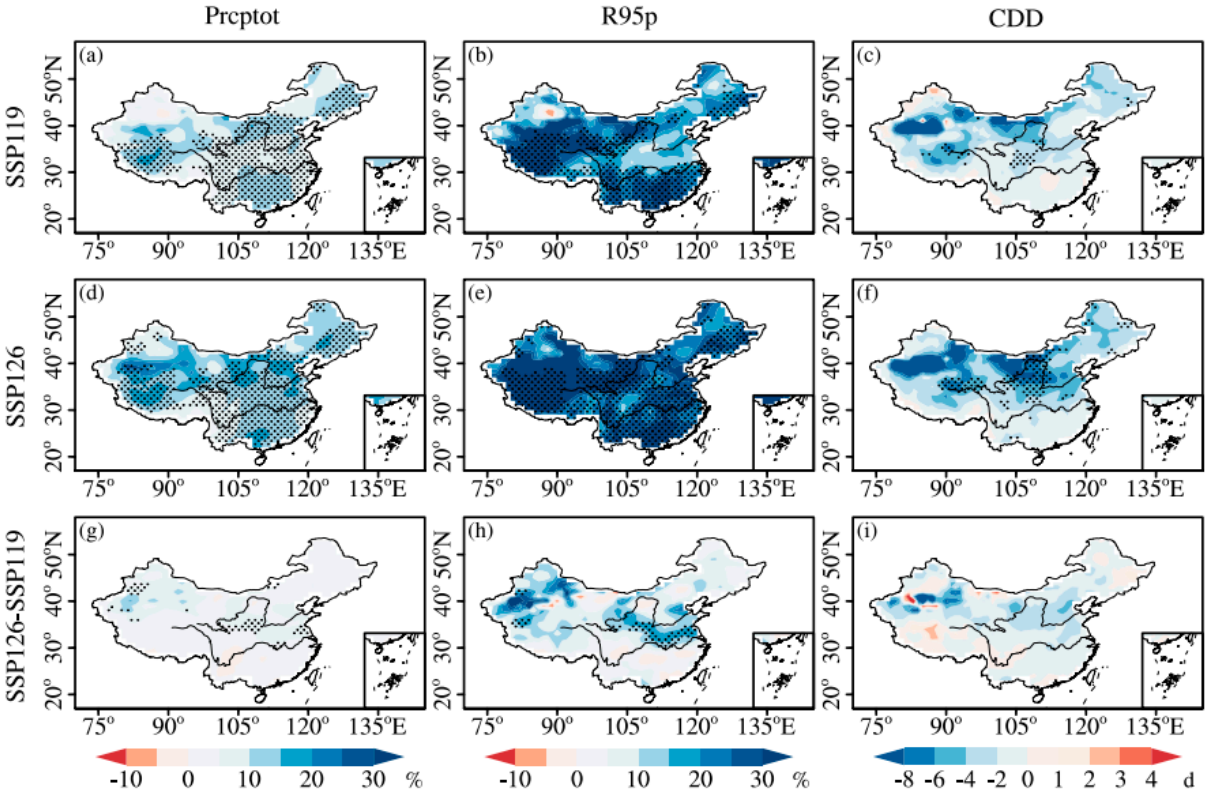


Figure S2. Projected changes, relative to 1995 – 2014, in Prcptot, R95p, and CDD under carbon neutrality in SSP1-1.9 (a-c) and SSP1-2.6 (d-f) and their differences (g-i, SSP1-2.6 minus SSP1-1.9) from MME. Dotted regions represent significant changes at the 95% confidence level based on the Student's *t* test.

Table S1. PCC, RSD, CRMSE, and IVS scores of 12 CMIP6 models, MME, and REA.

Name	Tav				TXx				TNn				Prcptot				R95p				CDD			
	PCC	RSD	CR MSE	IVS	PCC	RSD	CR MSE	IVS	PCC	RSD	CR MSE	IVS	PCC	RSD	CR MSE	IVS	PCC	RSD	CR MSE	IVS	PCC	RSD	CR MSE	IVS
CanESM5	0.92	1.13	0.41	0.70	0.86	0.96	0.36	0.95	0.87	1.28	0.65	0.80	0.84	1.37	0.75	1.47	0.73	1.33	0.94	1.76	0.71	0.62	0.87	2.14
CNRM-ESM2-1	0.95	1.26	0.50	0.37	0.95	1.19	0.52	0.31	0.88	1.19	0.55	0.66	0.80	1.25	0.76	1.32	0.82	0.91	0.63	1.46	0.57	0.91	0.89	2.30
EC-Earth3-Veg	0.98	1.09	0.32	0.72	0.96	1.13	0.45	0.56	0.93	1.00	0.39	1.68	0.87	1.11	0.56	0.95	0.86	0.85	0.54	1.09	0.69	1.12	0.85	1.99
EC-Earth3-Veg-LR	0.97	1.07	0.31	0.65	0.95	1.10	0.41	0.59	0.93	0.97	0.36	1.88	0.85	1.07	0.57	0.85	0.78	0.79	0.58	1.17	0.64	1.02	0.85	2.31
FGOALS-g3	0.96	1.26	0.49	0.43	0.93	1.33	0.61	0.41	0.93	1.08	0.46	0.48	0.48	1.06	1.07	1.64	0.46	0.85	0.97	2.28	0.48	0.82	0.94	2.64
GFDL-ESM4	0.97	1.04	0.30	0.20	0.94	1.11	0.44	0.65	0.91	0.96	0.36	0.70	0.70	1.11	0.78	1.07	0.68	1.02	0.80	1.47	0.71	0.73	0.71	1.54
IPSL-CM6A-LR	0.95	1.35	0.58	0.58	0.94	1.32	0.59	0.65	0.84	1.39	0.71	1.11	0.80	1.10	0.68	1.41	0.75	0.86	0.66	1.64	0.47	1.73	1.16	3.12
MIROC6	0.94	1.09	0.35	0.75	0.80	1.31	0.70	0.62	0.93	0.99	0.36	0.79	0.79	1.22	0.74	1.55	0.75	1.06	0.74	2.05	0.46	0.22	0.92	4.86
MIROC-ES2L	0.89	1.01	0.33	0.43	0.81	0.92	0.38	0.35	0.91	0.99	0.36	0.50	0.84	1.21	0.71	1.71	0.80	0.69	0.59	2.04	-0.24	0.14	1.04	6.42
MPI-ESM-1-2-LR	0.95	0.96	0.28	0.25	0.86	0.95	0.36	0.52	0.93	0.89	0.37	0.59	0.72	1.12	0.77	1.69	0.70	0.69	0.71	1.71	0.51	0.90	0.95	3.92
MRI-ESM2-0	0.95	1.11	0.36	0.15	0.95	1.11	0.44	0.71	0.94	0.96	0.35	0.63	0.74	0.99	0.67	1.09	0.61	0.73	0.80	1.49	0.58	0.41	0.83	3.29
UKESM1-0-LL	0.97	1.01	0.28	0.65	0.94	1.08	0.40	0.64	0.94	1.03	0.37	1.19	0.88	1.39	0.78	0.98	0.92	1.36	0.78	1.17	0.64	0.66	0.77	2.73
MME	0.97	1.10	0.34	0.27	0.95	1.08	0.39	0.63	0.94	1.03	0.35	0.72	0.83	1.09	0.74	1.19	0.82	0.85	0.58	1.48	0.65	0.68	0.70	1.89
REA	0.99	1.04	0.30	0.23	0.98	1.05	0.29	0.41	0.97	0.99	0.23	0.51	0.92	1.02	0.57	0.86	0.92	0.83	0.53	0.98	0.78	0.73	0.46	1.08

Table S2. The areal-mean biases (simulation minus observation) of all indices in MME and REA for 1995-2014.

Region	Tav (℃)		TXx (℃)		TNn (℃)		Prcptot (%)		R95p (%)		CDD (%)	
	REA	MME	REA	MME	REA	MME	REA	MME	REA	MME	REA	MME
CN	-0.79	-1.33	0.24	0.70	-2.41	-4.45	34.10	77.38	49.82	94.23	-17.46	-25.24
NE	-0.48	-0.63	0.33	0.57	-0.59	-0.82	27.55	39.15	52.94	61.13	-19.52	-25.52
NC	-0.44	-0.61	1.67	2.47	-1.15	-2.67	10.12	19.44	17.55	23.22	-11.69	-18.16
NW	-0.48	-0.97	0.94	2.02	-1.82	-3.78	43.29	141.97	66.90	161.10	-23.83	-36.33
TB	-1.93	-3.77	-0.76	-0.70	-5.08	-9.31	71.93	128.80	95.62	169.12	-35.17	-48.20
YR	-0.60	-0.96	-0.14	-0.09	-3.02	-5.28	3.37	7.82	-0.43	-1.69	1.86	1.78
SE	-0.23	-0.18	-0.91	-1.01	-1.84	-2.81	-2.80	-0.89	-16.39	-16.39	2.73	4.55
SW	-0.57	-0.69	0.06	0.67	-1.81	-4.10	27.19	48.17	17.13	36.05	-11.82	-14.15

Table S3. The areal-mean changes in temperature indices over China and the seven subregions.

Region		Tav (℃)				TXx (℃)				TNn (℃)			
		REA	MME	Min	Max	REA	MME	Min	Max	REA	MME	Min	Max
CN	Early	1.27	1.32	0.56	1.99	1.31	1.38	0.77	2.09	1.45	1.59	0.91	3.17
	Late	1.61	1.70	0.73	2.52	1.69	1.78	0.85	2.92	1.84	2.08	0.41	3.45
	Diff	0.34	0.38	0.15	0.64	0.38	0.40	0.08	0.83	0.39	0.49	-0.62	1.18
NE	Early	1.38	1.40	0.37	1.94	1.33	1.27	-0.16	2.30	1.89	1.99	0.61	3.35
	Late	1.66	1.71	0.33	2.82	1.54	1.51	0.65	2.69	2.46	2.57	0.42	4.15
	Diff	0.28	0.32	-0.05	0.93	0.21	0.23	-0.30	1.11	0.57	0.57	-0.34	2.48
NC	Early	1.41	1.47	0.72	2.27	1.42	1.47	0.58	2.31	1.66	1.89	0.47	3.85
	Late	1.66	1.77	0.64	2.58	1.73	1.81	0.61	2.94	1.67	2.03	-0.43	5.16
	Diff	0.25	0.30	-0.09	0.70	0.31	0.34	-0.30	1.79	0.01	0.13	-1.88	1.74
NW	Early	1.25	1.30	0.41	2.04	1.40	1.55	0.39	2.42	1.29	1.22	0.38	2.50
	Late	1.58	1.66	0.59	2.42	1.85	2.01	0.54	2.97	1.65	1.66	0.22	2.55
	Diff	0.32	0.35	0.13	0.65	0.46	0.46	0.14	0.89	0.36	0.44	-0.72	1.43
TB	Early	1.17	1.27	0.50	2.14	1.17	1.37	0.56	3.41	1.32	1.41	-0.04	2.76
	Late	1.63	1.76	0.92	2.97	1.63	1.85	1.19	4.54	1.84	2.05	0.74	3.31
	Diff	0.46	0.50	0.37	0.83	0.46	0.49	0.11	1.13	0.53	0.64	-0.21	1.66
YR	Early	1.38	1.45	0.87	2.32	1.51	1.51	0.64	2.69	1.52	2.11	0.42	5.73
	Late	1.70	1.83	0.86	2.72	1.81	1.85	0.68	3.71	1.75	2.63	0.27	6.51
	Diff	0.32	0.38	0.00	0.79	0.30	0.34	-0.13	1.55	0.23	0.52	-1.37	1.92
SE	Early	1.19	1.20	0.79	1.91	1.15	1.06	0.48	1.49	1.20	1.52	0.77	3.58
	Late	1.54	1.60	0.86	2.45	1.61	1.50	0.70	2.36	1.56	1.96	0.84	3.76
	Diff	0.36	0.40	0.01	0.60	0.45	0.45	-0.07	1.08	0.36	0.44	-0.92	1.17
SW	Early	0.98	1.02	0.60	1.72	1.05	1.01	0.39	2.10	1.13	1.20	0.46	2.50
	Late	1.34	1.42	0.89	2.30	1.43	1.48	0.73	2.10	1.46	1.67	0.41	3.50
	Diff	0.36	0.40	0.18	0.63	0.38	0.47	-0.30	1.40	0.33	0.47	-0.54	1.55

Table S4. The areal-mean changes in precipitation indices over China and the seven subregions.

Region		Prcptot (%)				R95p (%)				CDD (%)			
		REA	MME	Min	Max	REA	MME	Min	Max	REA	MME	Min	Max
CN	Early	9.5	9.2	2.9	16.4	20.8	22.6	4.7	48.0	-3.5	-3.0	-7.0	1.0
	Late	13.3	12.7	3.6	23.9	29.6	31.0	10.4	55.9	-4.8	-4.2	-7.6	1.2
	Diff	3.8	3.5	-0.4	8.4	8.8	8.3	1.1	20.8	-1.3	-1.3	-3.4	0.6
NE	Early	10.7	9.7	-0.4	24.5	18.4	19.0	2.0	40.6	-3.8	-3.1	-10.1	2.5
	Late	13.8	12.7	0.4	30.5	24.5	25.2	0.2	53.9	-4.1	-3.8	-9.3	2.1
	Diff	3.1	3.0	-1.5	8.2	6.0	6.1	-4.9	16.4	-0.3	-0.7	-3.7	5.3
NC	Early	10.5	10.7	2.4	20.9	17.6	19.4	-1.1	41.7	-3.8	-3.2	-10.9	4.4
	Late	14.9	15.1	-2.0	29.4	26.1	28.3	1.7	56.9	-6.3	-5.5	-10.8	0.3
	Diff	4.4	4.4	-8.0	14.7	8.5	8.9	-19.2	34.3	-2.4	-2.4	-8.1	5.9
NW	Early	8.6	8.0	-2.6	17.8	19.7	24.0	0.1	62.7	-6.1	-4.9	-16.3	1.1
	Late	15.5	13.8	-1.2	32.2	33.1	36.3	4.9	80.1	-8.2	-7.0	-15.4	6.0
	Diff	6.9	5.9	-2.4	16.7	13.3	12.4	2.9	34.1	-2.1	-2.1	-9.2	5.0
TB	Early	9.7	9.3	2.0	17.4	26.3	26.0	7.5	44.9	-2.5	-2.3	-3.2	0.2
	Late	12.2	11.2	2.2	21.0	36.1	33.2	9.7	57.4	-3.3	-2.7	-5.9	-0.5
	Diff	2.5	1.9	-1.1	5.6	9.8	7.2	-1.5	15.7	-0.8	-0.4	-3.7	1.6
YR	Early	8.8	8.9	3.3	20.7	16.1	17.8	-1.8	46.5	-1.3	-1.4	-6.5	1.9
	Late	12.5	12.6	1.1	26.4	24.9	26.7	11.2	55.0	-3.1	-2.9	-9.2	1.4
	Diff	3.6	3.7	-2.2	11.8	8.9	8.9	2.7	14.8	-1.8	-1.5	-6.3	1.6
SE	Early	12.0	11.7	4.2	22.0	27.0	28.9	0.8	55.8	-0.8	-0.7	-7.6	5.5
	Late	12.3	12.9	4.8	25.9	29.0	31.7	4.5	65.9	-1.3	-1.2	-5.0	4.2
	Diff	0.4	1.2	-3.1	9.0	1.9	2.9	-19.0	17.9	-0.5	-0.5	-4.5	3.6
SW	Early	7.4	7.7	1.7	13.7	24.8	23.8	3.2	43.4	-1.0	-0.7	-5.7	3.4
	Late	7.6	8.1	0.5	14.9	28.4	27.1	4.7	53.2	-1.4	-1.3	-6.3	4.5
	Diff	0.3	0.4	-4.0	4.6	3.6	3.4	-8.4	13.7	-0.4	-0.5	-3.1	1.5

Table S5. The areal-mean SD and SNR of all indices in REA over China and the seven subregions.

Region		Tav		TXx		TNn		Prcptot		R95p		CDD	
		SD	SNR	SD	SNR	SD	SNR	SD	SNR	SD	SNR	SD	SNR
CN	Early	0.46	2.92	0.69	2.04	0.85	1.80	9.15	1.27	23.48	1.13	6.03	0.63
	Late	0.52	3.28	0.78	2.32	1.00	1.97	11.26	1.39	26.70	1.38	6.32	0.80
	Diff	0.22	1.86	0.49	0.90	0.79	0.59	6.46	0.67	18.11	0.62	5.39	0.43
NE	Early	0.52	2.74	0.88	1.63	1.09	1.78	9.54	1.21	19.53	1.08	5.53	0.73
	Late	0.65	2.66	0.82	2.03	1.33	1.87	11.06	1.35	23.89	1.19	4.98	0.94
	Diff	0.32	0.89	0.61	0.43	0.87	0.73	5.90	0.56	16.96	0.40	4.70	0.27
NC	Early	0.46	3.13	0.71	2.09	0.98	1.75	8.39	1.40	22.22	0.91	6.13	0.65
	Late	0.55	3.11	0.81	2.30	1.23	1.35	12.53	1.36	27.43	1.11	6.46	1.01
	Diff	0.28	0.94	0.56	0.62	1.05	0.19	7.75	0.67	19.24	0.53	5.90	0.47
NW	Early	0.53	2.41	0.69	2.12	0.83	1.64	12.35	0.89	33.21	0.85	9.32	0.71
	Late	0.54	3.05	0.80	2.41	0.92	1.96	15.40	1.19	37.70	1.12	9.81	0.87
	Diff	0.17	2.15	0.43	1.13	0.79	0.52	9.37	0.94	26.13	0.72	7.65	0.46
TB	Early	0.46	2.68	0.64	1.92	0.77	1.82	8.14	1.48	20.28	1.51	4.62	0.73
	Late	0.52	3.28	0.66	2.63	0.92	2.16	9.36	1.57	22.82	1.87	5.20	0.82
	Diff	0.17	2.88	0.42	1.19	0.68	0.83	4.21	0.72	13.12	0.89	4.92	0.51
YR	Early	0.41	3.49	0.74	2.10	0.83	1.91	6.18	1.53	16.85	1.08	3.11	0.50
	Late	0.49	3.56	0.99	1.90	0.95	1.94	8.69	1.52	18.14	1.54	3.89	0.80
	Diff	0.23	1.46	0.49	0.68	0.85	0.39	5.28	0.67	12.15	0.80	3.20	0.59
SE	Early	0.29	4.16	0.44	2.73	0.58	2.11	6.90	1.81	20.51	1.50	4.12	0.23
	Late	0.33	4.80	0.65	2.58	0.64	2.47	7.56	1.74	20.28	1.58	3.77	0.41
	Diff	0.20	1.88	0.48	1.03	0.61	0.63	4.67	0.21	14.19	0.28	3.29	0.29
SW	Early	0.31	3.40	0.50	2.17	0.56	2.15	4.88	1.52	14.57	1.69	3.68	0.44
	Late	0.35	3.91	0.60	2.45	0.71	2.16	5.19	1.48	18.00	1.54	3.91	0.53
	Diff	0.16	2.40	0.49	0.79	0.59	0.65	3.43	0.32	11.92	0.32	3.08	0.33