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Supplement of

Mapping the future afforestation distribution of China constrained by a national afforestation plan and climate change

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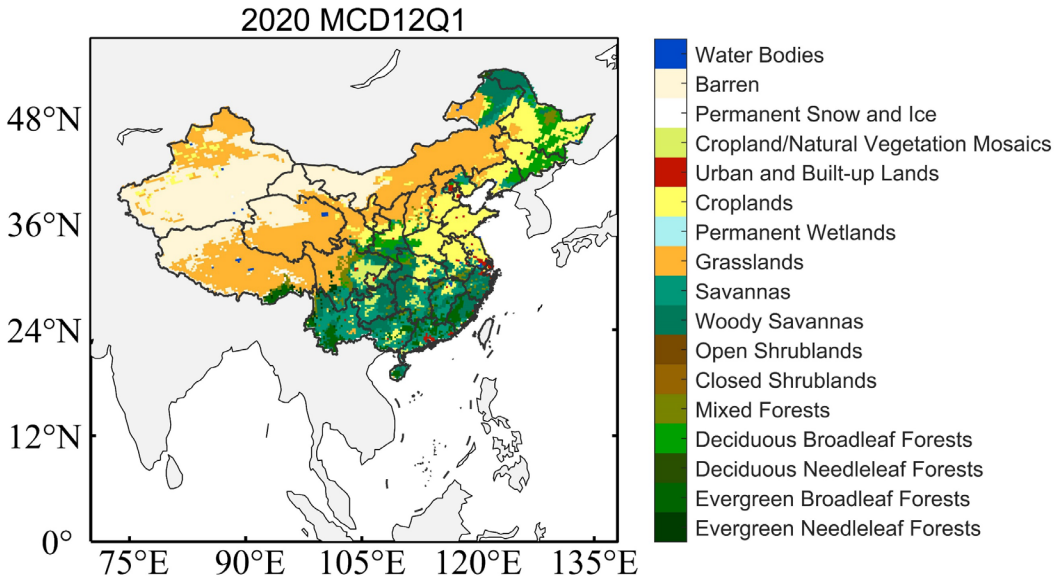

Figure S1: Spatial distribution of land use and cover types in 2020 based on the MCD12Q1 data.

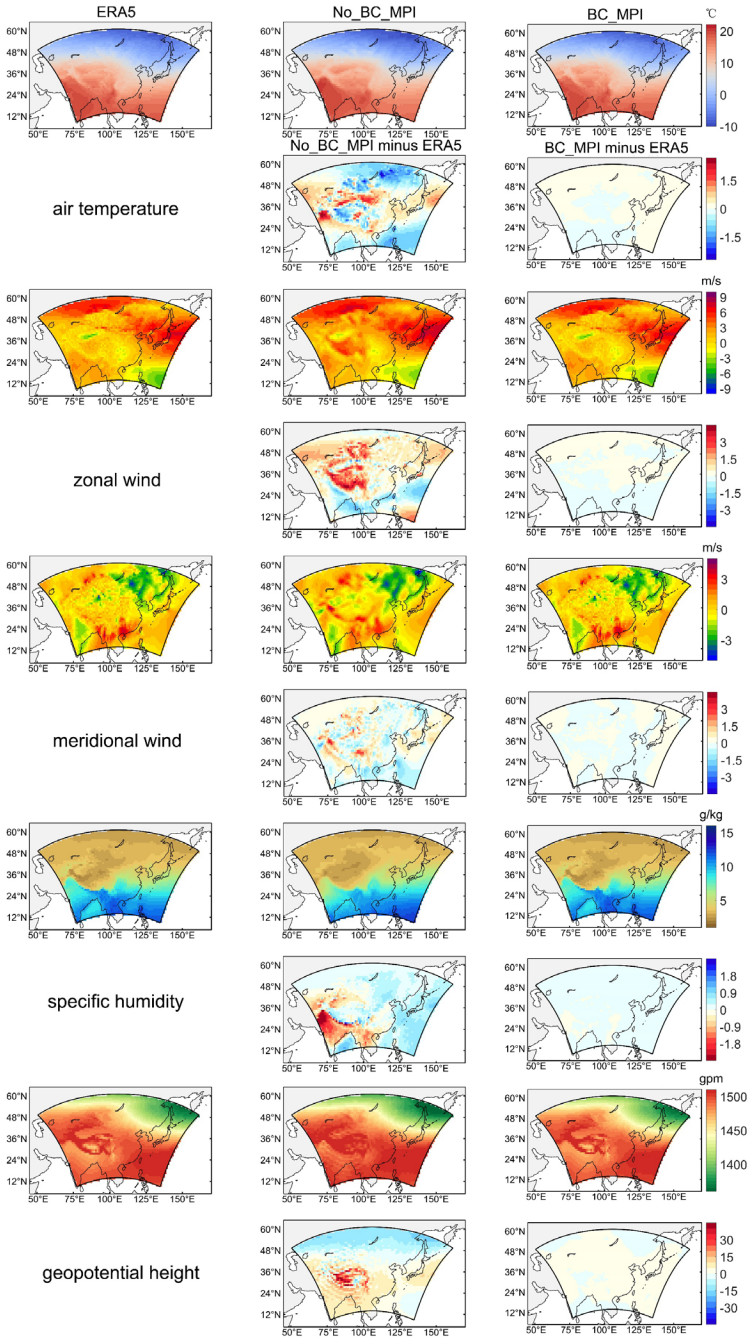

Figure S2: Comparison of ERA5 reanalysis data with raw (No_BC_MPI) and bias-corrected historical MPI–ESM1–2–HR model (BC_MPI) at the pressure of 850 hPa for the period 1995–2014. The odd rows represent the spatial distribution of climatology, and the even rows represent the differences.

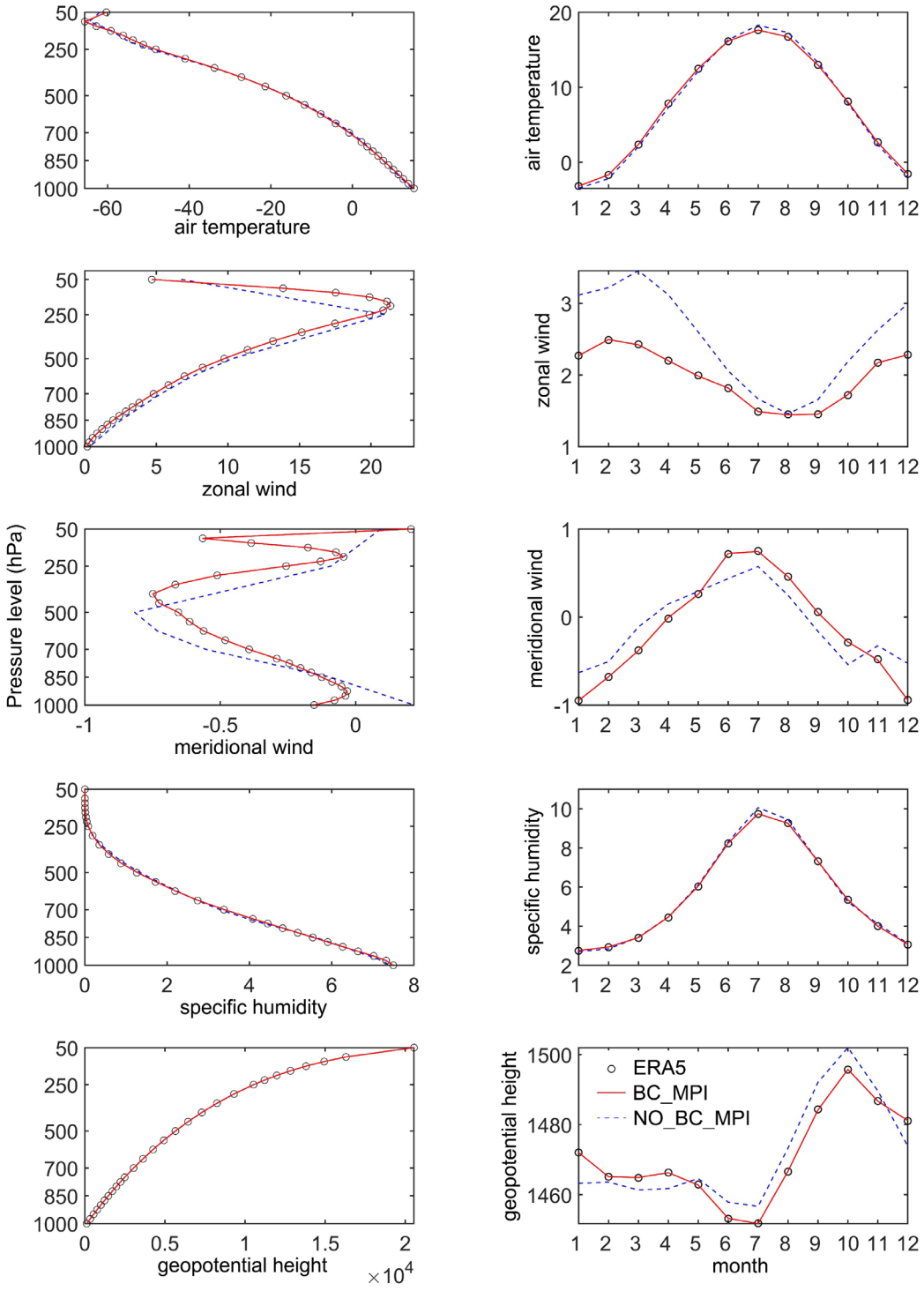

Figure S3: Comparison of ERA5 reanalysis data with raw (No_BC_MPI) and bias-corrected historical MPI–ESM1–2–HR model (BC_MPI) at the different pressure levels and months.

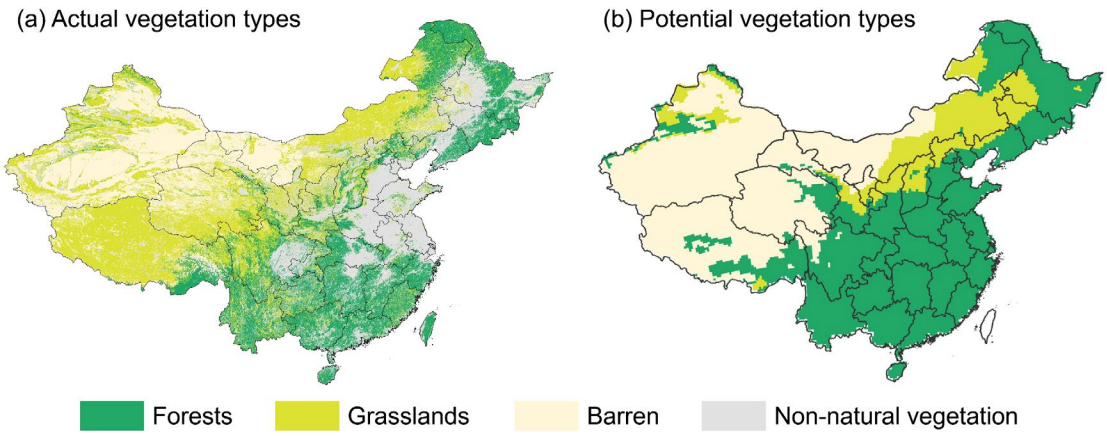

Figure S4: Comparison of actual (a) and potential (b) nature vegetation types. The actual vegetation in the year 2005 refers to China's Land-Use/cover Datasets (CLUDs), which has a spatial resolution of 1- by 1 km and covers the entire China (Liu et al., 2014). The potential vegetation types derived from the HLZ model are based on the average of 1995-2014.

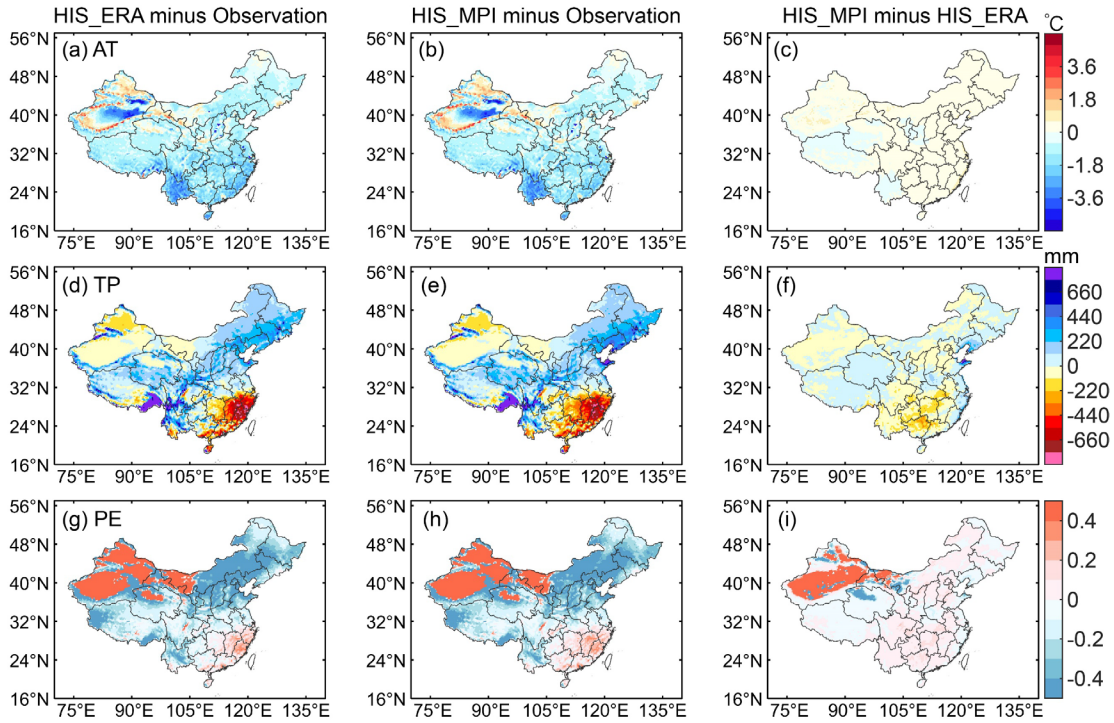

Figure S5: Differences between simulated and observed climatological mean of the AT, TP, and PE in China during the historical periods (1995-2014). HIS_MPI and HIS_ERA indicate the LBCs driving the WRF model from the MPI–ESM1–2–HR model and ERA5.

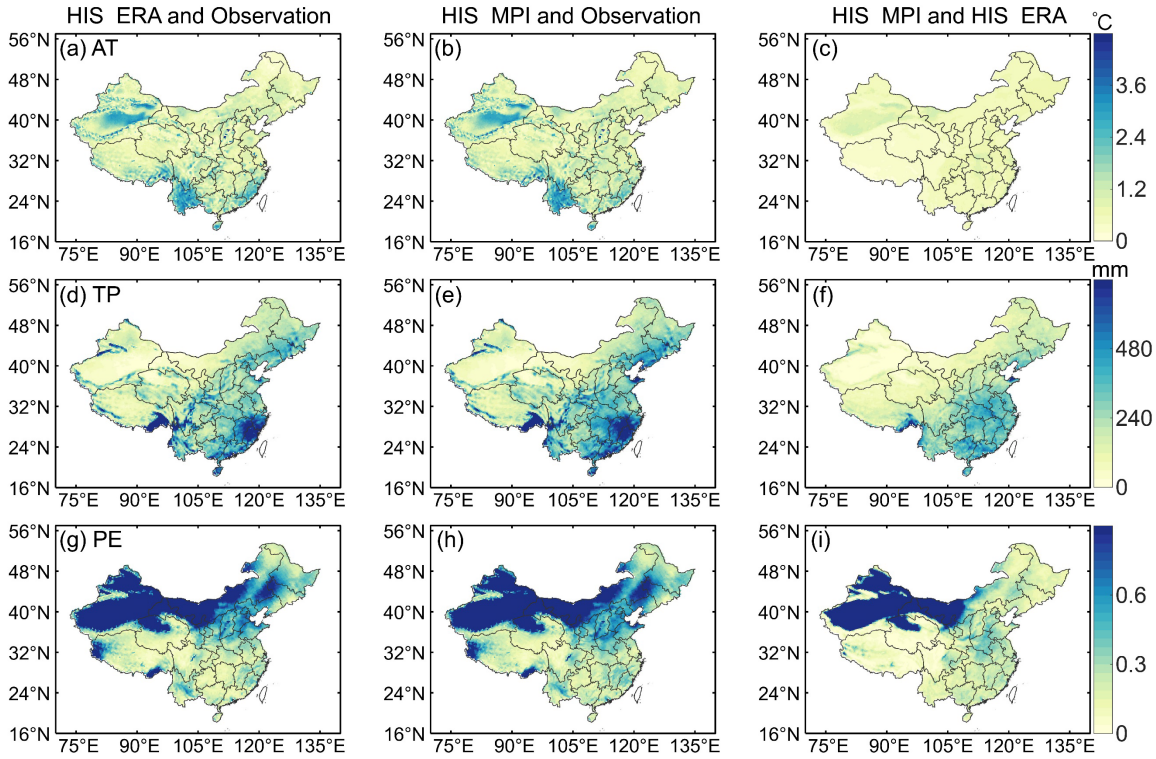

Figure S6: Comparison of observation, HIS_ERA and HIS_MPI based on RMSE. HIS_ERA and HIS_MPI indicate the WRF simulation driven by ERA5 reanalysis data and bias-corrected MPI–ESM1–2–HR model, respectively. The observation derives from the CN05.1 dataset.

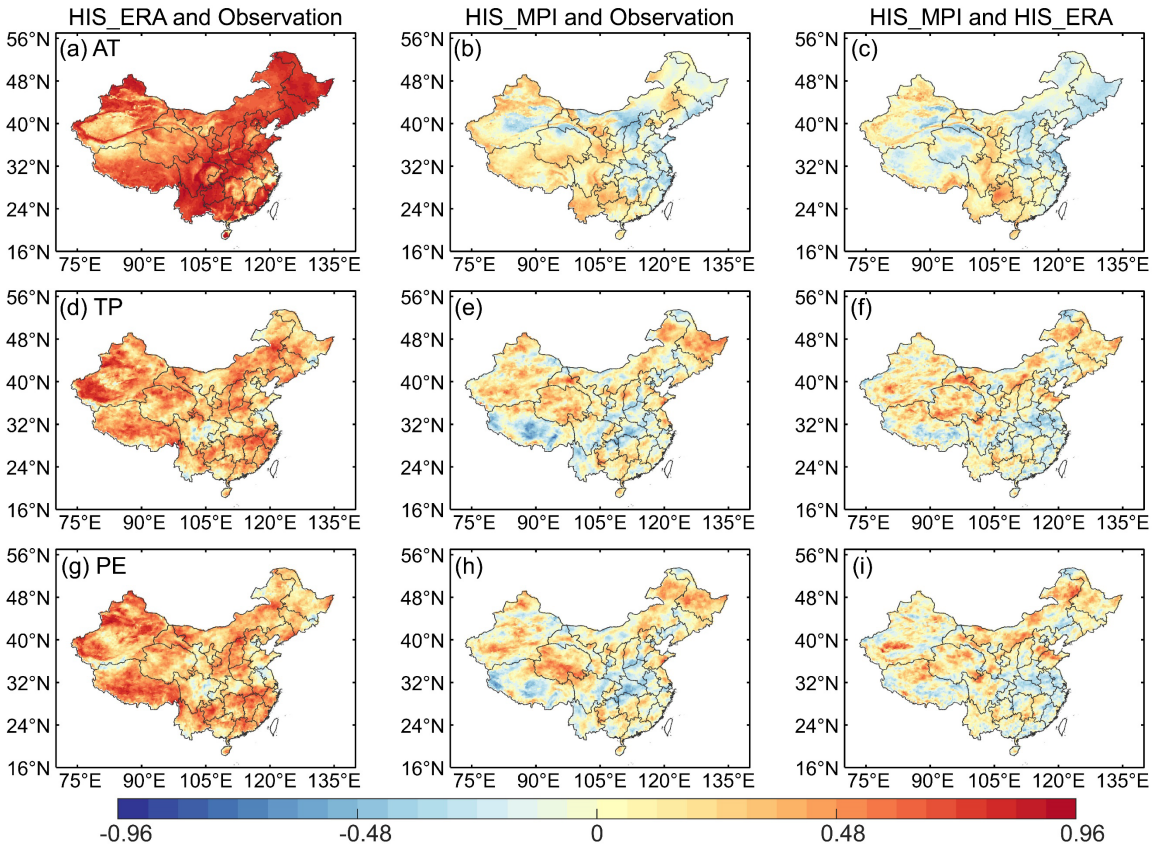

Figure S7: Comparison of observation, HIS_ERA and HIS_MPI based on spatial correlation coefficient. HIS_ERA and HIS_MPI indicate the WRF simulation driven by ERA5 reanalysis data and bias-corrected MPI–ESM1–2–HR model, respectively. The observation derives from the CN05.1 dataset

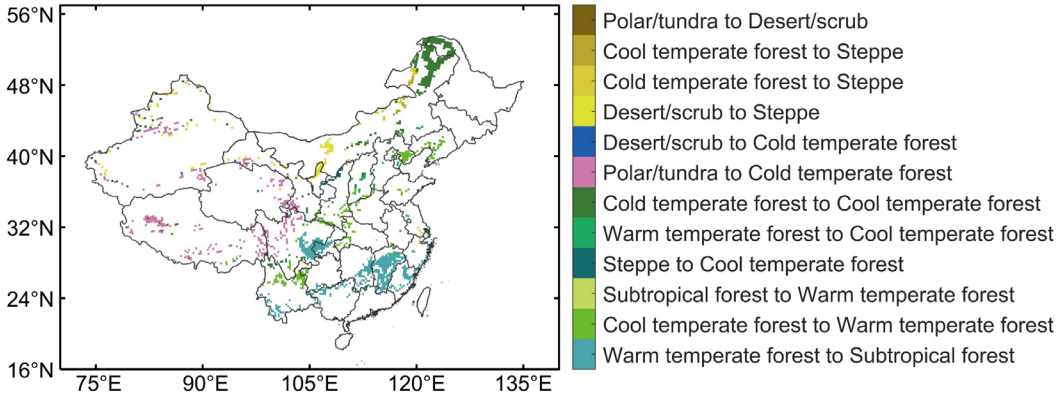

Figure S8: Projected changes (FUT_ MPI versus HIS_ MPI) in major vegetation types under SSP2-4.5 comparing to 1995–2014. The shifted total areas of vegetation types exceeding 6250 m^2 (10 grids) are exhibited.

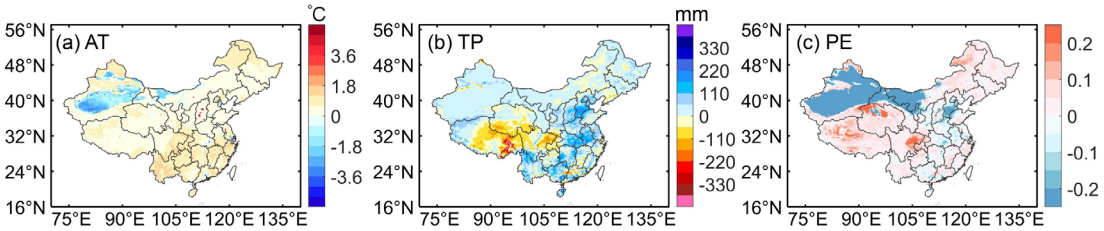

Figure S9: Projected changes (FUT_ MPI versus HIS_ MPI) in key climate variables (AT, TP, and PE) under SSP2-4.5 comparing to 1995–2014.

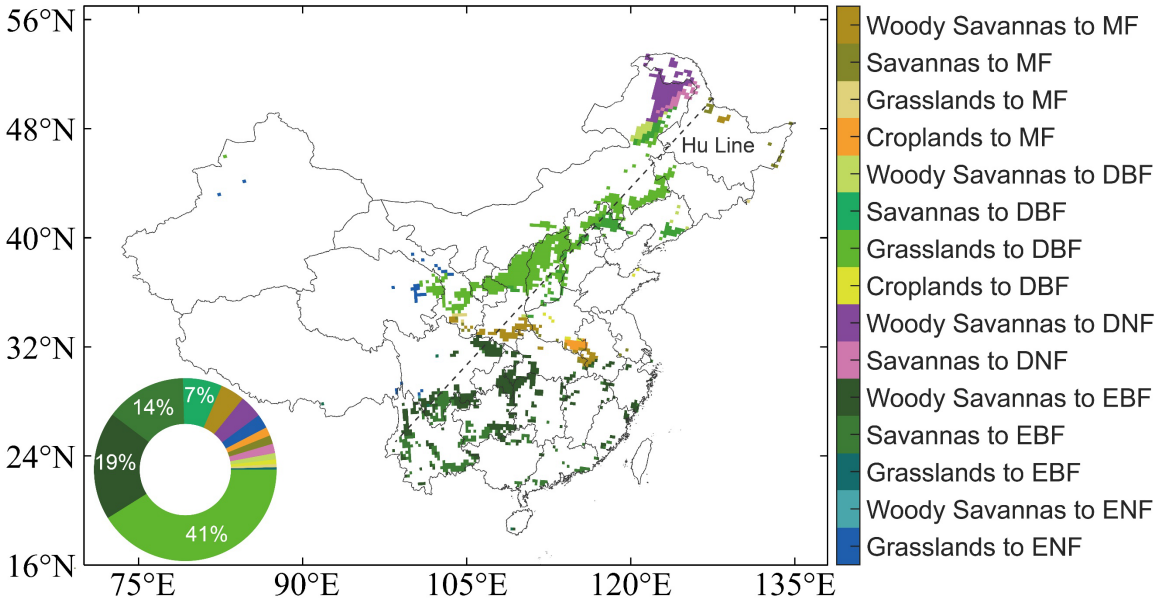

Figure S10: Same as Fig. 7 but for the index that areas with high total annual precipitation is given priority for afforestation.

Table S1: The IGBP classification scheme of MCD12Q1 products

Name	Value	Description
Evergreen Needleleaf Forests	1	Dominated by evergreen conifer trees (canopy>2m). Tree cover >60%.
Evergreen Broadleaf Forests	2	Dominated by evergreen broadleaf and palmate trees (canopy >2m). Tree cover >60%.
Deciduous Needleleaf Forests	3	Dominated by deciduous needleleaf (larch) trees (canopy >2m). Tree cover >60%.
Deciduous Broadleaf Forests	4	Dominated by deciduous broadleaf trees (canopy >2m). Tree cover >60%.
Mixed Forests	5	Dominated by neither deciduous nor evergreen (40-60% of each) tree type (canopy >2m). Tree cover >60%.
Closed Shrublands	6	Dominated by woody perennials (1-2m height) >60% cover.
Open Shrublands	7	Dominated by woody perennials (1-2m height) 10-60% cover.
Woody Savannas	8	Tree cover 30-60% (canopy >2m).
Savannas	9	Tree cover 10-30% (canopy >2m).
Grasslands	10	Dominated by herbaceous annuals (<2m).
Permanent Wetlands	11	Permanently inundated lands with 30-60% water cover and >10% vegetated cover.
Croplands	12	At least 60% of area is cultivated cropland.
Urban and Built-up Lands	13	At least 30% impervious surface area including building materials, asphalt, and vehicles.
Cropland/Natural Vegetation Mosaics	14	Mosaics of small-scale cultivation 40-60% with natural tree, shrub, or herbaceous vegetation.
Permanent Snow and Ice	15	At least 60% of area is covered by snow and ice for at least 10 months of the year.
Barren	16	At least 60% of area is non-vegetated barren (sand, rock, soil) areas with less than 10% vegetation.
Water Bodies	17	At least 60% of area is covered by permanent water bodies.
Unclassied	255	Has not received a map label because of missing inputs.

Table S2: Area of afforestation region of each province in China (unit: 10^4 km^2)

Provinces	Historical open area regions	Projected forest suitable lands	Projected potential afforestation regions constrained by climate change	National planed afforestation (NFMP)	Final future potential afforestation region constrained by climate change and national policy
Inner Mongolia	94.68	45.18	38.62	12.23	12.26
Shanxi	9.00	14.69	9.00	8.99	9.00
Shaanxi	8.45	17.58	7.58	7.20	7.19
Yunnan	21.37	30.07	20.38	6.91	6.91
Gansu	31.23	13.50	6.75	5.87	5.89
Sichuan	27.06	22.41	8.47	5.66	5.64
Hebei	7.70	16.76	7.70	4.17	4.18
Guizhou	9.68	12.93	9.68	3.46	3.46
Henan	0.71	15.89	0.71	2.34	2.33
Qinghai	67.94	3.13	2.88	2.30	2.31
Hunan	10.48	16.23	10.48	1.91	1.91
Hubei	6.03	14.40	6.03	1.64	1.66
Chongqing	2.38	6.63	2.38	1.37	1.38
Heilongjiang	6.37	38.17	6.37	1.25	1.26
Liaoning	3.24	12.80	3.24	1.11	1.12
Guangxi	12.44	19.15	12.44	1.11	1.12
Guangdong	8.39	15.39	8.39	1.08	1.09
Anhui	2.28	12.65	2.28	0.75	0.76
Jiangxi	8.09	13.84	8.09	0.72	0.70
Ningxia	3.75	1.38	0.69	0.70	0.69
Tibet	110.50	4.63	0.31	0.61	0.25
Fujian	3.63	9.19	3.63	0.59	0.60
Jilin	1.75	17.31	1.75	0.53	0.56
Zhejiang	4.68	6.89	4.68	0.46	0.46
Beijing	0.54	1.54	0.54	0.31	0.33
Xinjiang	147.81	5.81	5.56	0.21	0.19
Shandong	0.06	14.19	0.06	0.11	0.13
Jiangsu	0.66	9.41	0.66	0.09	0.10
Hainan	1.88	2.69	1.88	0.07	0.07
Tianjin	0.06	1.19	0.06	0.03	0.06
Shanghai	0.05	0.44	0.05	0.00	0.05
Hong Kong	0.00	0.00	0.00	0.00	0.00
Macau	0.00	0.00	0.00	0.00	0.00
Taiwan	0.00	0.00	0.00	0.00	0.00
Total	612.88	416.08	191.33	73.78	73.64

Table S3: The classification scheme of HLZ model in this study

	Potential vegetation types	Reclassifications	AT (℃)	TP(mm)	PE
1	Polar/Nival area	Polar/tundra	1.1	353.6	0.2
2	Subpolar/Alpine dry tundra		2.1	88.4	1.4
3	Subpolar/Alpine moist tundra		2.1	177.8	0.7
4	Subpolar/Alpine wet tundra		2.1	353.6	0.4
5	Subpolar/Alpine rain tundra		2.1	707.1	0.2
6	Cold temperate dry scrub	Desert/scrub	4.2	177.8	1.4
7	Cool temperate desert scrub		8.5	177.8	2.8
8	Warm temperate desert scrub		14.3	177.8	5.7
9	Subtropical desert scrub		20.2	177.8	5.7
10	Tropical desert scrub		33.9	177.8	11.3
11	Desert		33.9	88.4	22.6
12	Cool temperate steppe	Steppe	8.5	353.6	1.4
13	Warm temperate thorn steppe		14.3	353.6	2.8
14	Cold temperate moist forest	Cold temperate forest	4.2	353.6	0.7
15	Cold temperate wet forest		4.2	707.2	0.4
16	Cold temperate rain forest		4.2	1414.2	0.2
17	Cool temperate moist forest	Cool temperate forest	8.5	707.1	0.7
18	Cool temperate wet forest		8.5	1414.2	0.4
19	Cool temperate rain forest		8.5	2828.4	0.2
20	Warm temperate dry forest	Warm temperate forest	14.3	707.1	1.4
21	Warm temperate moist forest		14.3	1414.2	0.7
22	Warm temperate wet forest		14.3	2828.4	0.4
23	Subtropical thorn woodland	Subtropical forest	20.2	353.6	2.8
24	Subtropical dry forest		20.2	707.1	1.4
25	Subtropical moist forest		20.2	1414.2	0.7
26	Subtropical wet forest		20.2	2828.4	0.4
27	Subtropical rain forest		20.2	5656.9	0.2
28	Tropical thorn woodland	Tropical forest	33.9	353.6	5.7
29	Tropical very dry forest		33.9	707.1	2.8
30	Tropical dry forest		33.9	1414.2	1.4
31	Tropical moist forest		33.9	2828.4	0.7
32	Tropical wet forest		33.9	5656.9	0.4
33	Tropical rain forest		33.9	11313.7	0.2

References

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