# Mapping the Future Afforestation Distribution of China Constrained by National Afforestation Plan and Climate Change

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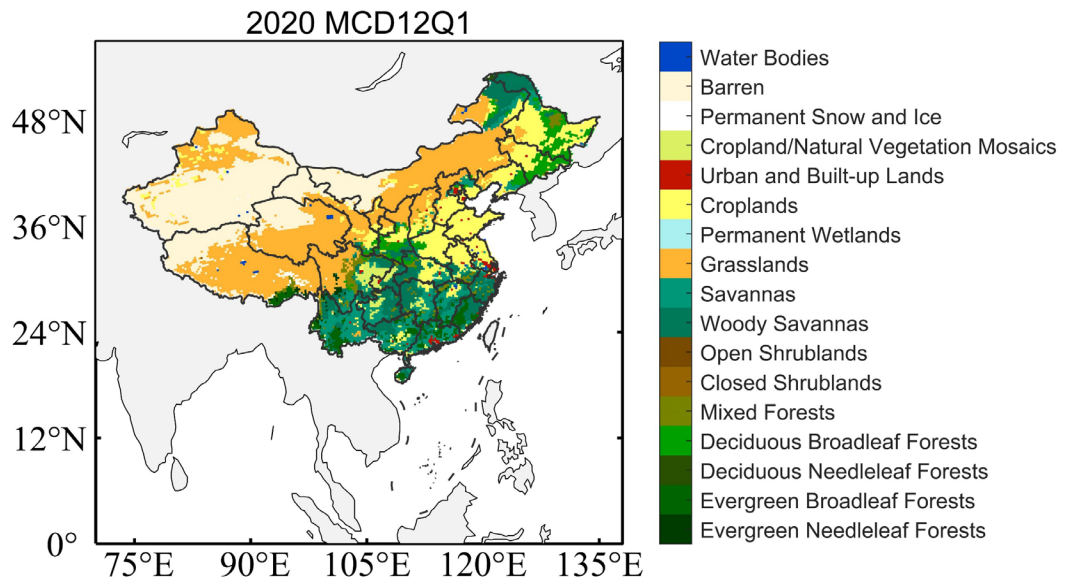[3]University of Chinese Academy of Sciences, Beijing 100049, People's Republic of China.


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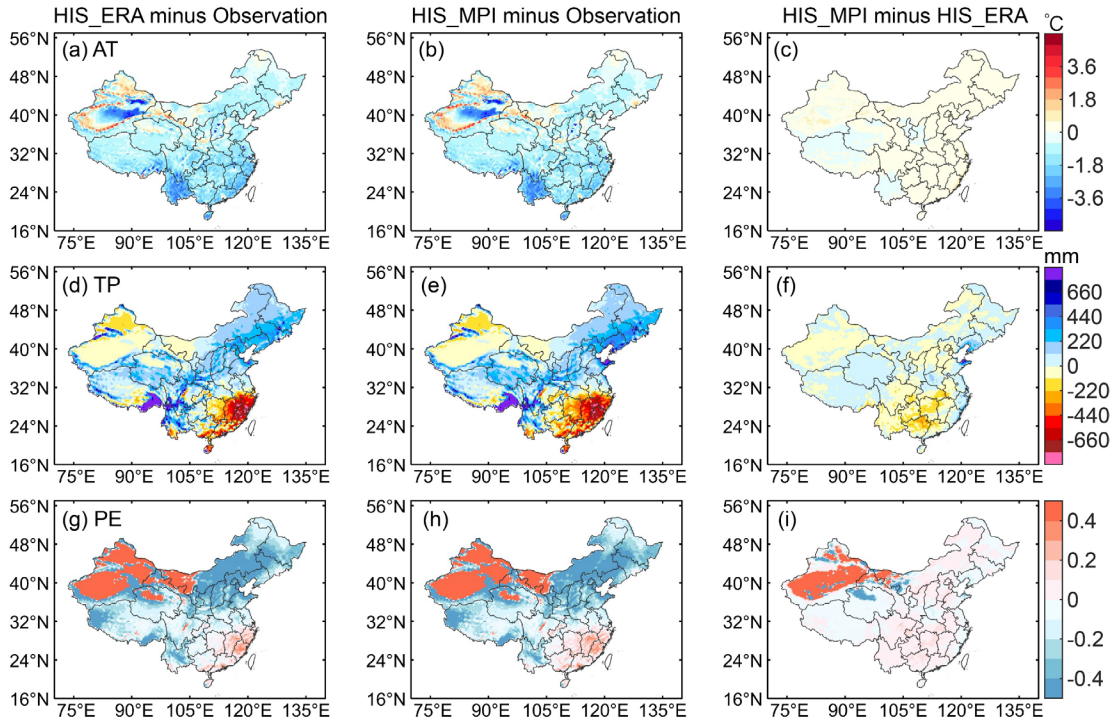
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**2020 MCD12Q1**

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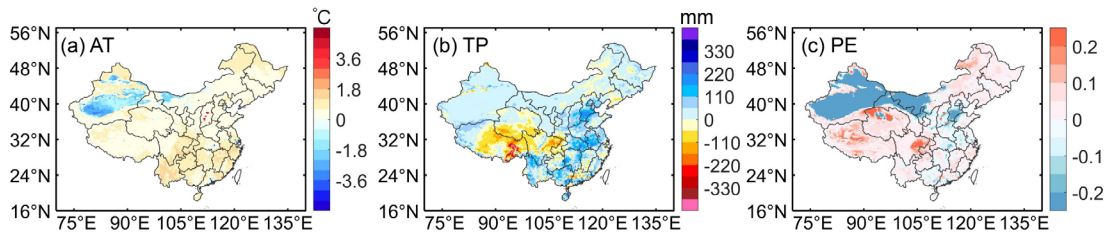
**Figure S1:** Spatial distribution of land use and cover types in 2020 based on the MCD12Q1 data.

**Figure S2:** 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 model and ERA5.

**Figure S3:** Projected changes (FUT_ MPI versus HIS_ MPI) in key climate variables (AT, TP, and PE) under SSP2-4.5 comparing to 1995–2014.
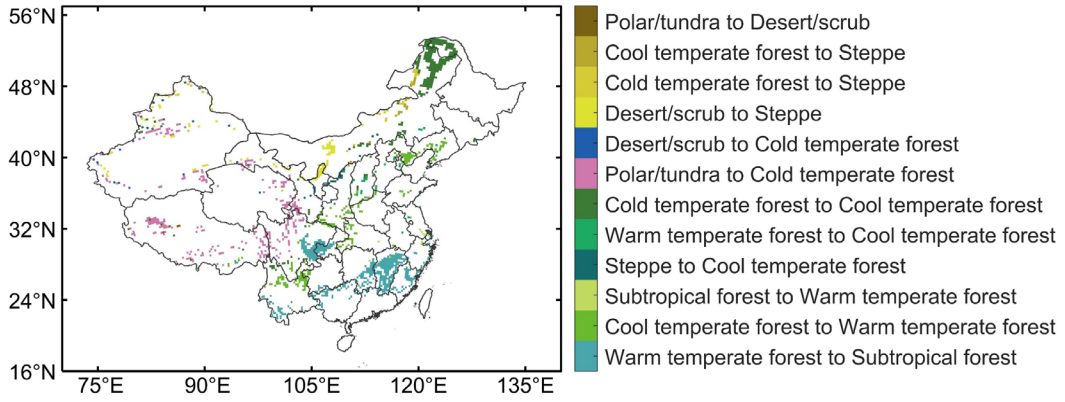
**Figure S4:** Projected changes (FUT_ MPI versus HIS_ MPI) in major vegetation types under SSP2-4.5 comparing to 1995–2014. The shifted total areas of vegetation types exceeding 6250 m$^2$ (10 grids) are exhibited.

**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 | 12.25 |
| Shanxi | 9.00 | 14.69 | 9.00 | 8.99 | 9.00 |
| Shannxi | 8.45 | 17.58 | 7.58 | 7.20 | 7.20 |
| Yunnan | 21.37 | 30.07 | 20.38 | 6.91 | 6.88 |
| Gansu | 31.23 | 13.50 | 6.75 | 5.87 | 5.88 |
| Sichuan | 27.06 | 22.41 | 8.47 | 5.66 | 5.67 |
| Hebei | 7.70 | 16.76 | 7.70 | 4.17 | 4.14 |
| Guizhou | 9.68 | 12.93 | 9.68 | 3.46 | 3.44 |
| 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 | 1.92 |
| Hubei | 6.03 | 14.40 | 6.03 | 1.64 | 1.63 |
| Chongqing | 2.38 | 6.63 | 2.38 | 1.37 | 1.38 |
| Heilongjiang | 6.37 | 38.17 | 6.37 | 1.25 | 1.23 |
| Liaoning | 3.24 | 12.80 | 3.24 | 1.11 | 1.11 |
| Guangxi | 12.44 | 19.15 | 12.44 | 1.11 | 1.11 |
| Guangdong | 8.39 | 15.39 | 8.39 | 1.08 | 1.08 |
| Anhui | 2.28 | 12.65 | 2.28 | 0.75 | 0.74 |
| Jiangxi | 8.09 | 13.84 | 8.09 | 0.72 | 0.72 |
| 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 | 0.48 |
| Beijing | 0.54 | 1.54 | 0.54 | 0.31 | 0.30 |
| 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 | 0.10 |
| Tianjin | 0.06 | 1.19 | 0.06 | 0.03 | 0.06 |
| Shanghai | 0.05 | 0.44 | 0.05 | 0.00 | 0.05 |
| Hong Kong | \ | \ | \ | \ | \ |
| Macau | \ | \ | \ | \ | \ |
| Taiwan | \ | \ | \ | \ | \ |
| Total | 612.88 | 416.08 | 191.33 | 73.78 | 73.51 |

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

| | Potential vegetation types | Reclassifications | AT (°C) | TP(mm) | PE |
|---|---|---|---|---|---|
| 1 | Polar/Nival area | | 1.1 | 353.6 | 0.2 |
| 2 | Subpolar/Alpine dry tundra | | 2.1 | 88.4 | 1.4 |
| 3 | Subpolar/Alpine moist tundra | Polar/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 | | 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 | 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 | | 4.2 | 353.6 | 0.7 |
| 15 | Cold temperate wet forest | Cold temperate forest | 4.2 | 707.2 | 0.4 |
| 16 | Cold temperate rain forest | | 4.2 | 1414.2 | 0.2 |
| 17 | Cool temperate moist forest | | 8.5 | 707.1 | 0.7 |
| 18 | Cool temperate wet forest | Cool temperate forest | 8.5 | 1414.2 | 0.4 |
| 19 | Cool temperate rain forest | | 8.5 | 2828.4 | 0.2 |
| 20 | Warm temperate dry forest | | 14.3 | 707.1 | 1.4 |
| 21 | Warm temperate moist forest | Warm temperate forest | 14.3 | 1414.2 | 0.7 |
| 22 | Warm temperate wet forest | | 14.3 | 2828.4 | 0.4 |
| 23 | Subtropical thorn woodland | | 20.2 | 353.6 | 2.8 |
| 24 | Subtropical dry forest | | 20.2 | 707.1 | 1.4 |
| 25 | Subtropical moist forest | Subtropical 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 | | 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 | Tropical 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 |