**Additional file 3: Table S1.** Median and ranges (minimum to maximum) of four climatic variables under current (JMA 1996) and 24 future climate scenarios (Meehl et al. 2007) with their spatial resolutions in the study area (36.25–36.5°N, 137.5–137.7°E). WI: warmth index (Kira 1948), TMC: temperature of the coldest month, PRS: summer (May-September) precipitation, MSW: maximum snow water equivalent. Summary of the current climate was shown above the dashline, and summaries of 24 future climate scenarios were shown under the dashline.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ID number | Climatic data | Spatial resolution  (degree) | WI (˚C·month) | TMC (˚C) | PRS (mm) | MSW (mm) |
| - | Current | 0.0083N × 0.0125E | 34.3 (6.8–80.9) | −13.5 (-20.2–−5.0) | 1482 (1171–1703) | 828 (283–1496) |
| 1 | BCCR-BCM2.0 | 2.8125N × 2.8125E | 49.8 (18.6–101.1) | −11.3 (-18.0–−2.6) | 1707 (1347–1969) | 741 (155–1537) |
| 2 | CCSM3 | 1.4063N × 1.4063E | 50.3 (18.1–102.1) | −11.3 (-18.1–−2.3) | 1756 (1384–2030) | 655 (140–1336) |
| 3 | CGCM3.1(T47) | 3.7500N × 3.7500E | 52.9 (21.0–105.1) | −10.1 (-16.5–−1.8) | 1771 (1390–2051) | 738 (131–1577) |
| 4 | CGCM3.1(T63) | 2.8125N × 2.8125E | 52.0 (20.4–104.0) | −10.6 (-17.2–−2.2) | 1711 (1340–1975) | 686 (132–1474) |
| 5 | CNRM-CM3 | 2.8125N × 2.8125E | 54.6 (22.0–106.7) | −10.1 (-16.3–−1.8) | 1574 (1239–1811) | 656 (83–1474) |
| 6 | CSIRO-Mk3.0 | 1.8750N × 1.8750E | 45.4 (15.3–96.5) | −11.7 (−18.3–−3.3) | 1510 (1180–1745) | 713 (181–1482) |
| 7 | CSIRO-Mk3.5 | 1.8750N × 1.8750E | 52.9 (20.2–105.0) | −10.0 (−16.7–−1.4) | 1493 (1164–1723) | 465 (56–1053) |
| 8 | ECHAM5/MPI-OM | 1.8750N × 1.8750E | 53.1 (20.3–106.4) | −9.5 (−16.2–−0.77) | 1156 (396–3847) | 651 (87–1453) |
| 9 | ECHO-G | 3.7500N × 3.7500E | 59.9 (26.6–113.6) | *−*9.1 (*−*15.7–*−*0.65) | 1638 (1280–1897) | 609 (69–1383) |
| 10 | FGOALS-g1.0 | 2.8125N × 2.8125E | 46.6 (15.9–97.3) | −11.2 (−17.8–−2.7) | 1672 (1315–1935) | 689 (143–1403) |
| 11 | GFDL-CM2.0 | 2.5000N × 2.0000E | 53.7 (20.9–106.9) | −9.4 (−16.0–−0.96) | 1828 (1415–2114) | 642 (79–1432) |
| 12 | GFDL-CM2.1 | 2.5000N × 2.0000E | 53.6 (20.9–106.0) | −8.8 (−15.4–−0.4) | 1571 (1240–1807) | 532 (48–1226) |
| 13 | GISS-AOM | 4.0000N × 3.0000E | 47.2 (15.8–98.8) | −11.2 (−17.7–−2.8) | 1416 (1112–1626) | 741 (157–1564) |
| 14 | GISS-EH | 5.0000N × 3.9130E | 48.9 (17.4–101.0) | −8.8 (−15.1–−0.46) | 1709 (1348–1971) | 656 (65–1503) |
| 15 | GISS-ER | 5.0000N × 3.9130E | 49.7 (17.7–102.4) | −10.7 (−17.2–−2.3) | 350 (278–401) | 148 (23–325) |
| 16 | INGV-SXG | 1.1250N × 1.1250E | 50.7 (19.1–102.1) | −10.4 (−16.9–−2.0) | 1500 (1184–1730) | 695 (117–1447) |
| 17 | INM-CM3.0 | 5.0000N × 4.0000E | 51.0 (18.4–103.5) | −10.5 (−16.7–−2.3) | 1452 (1125–1679) | 537 (96–1145) |
| 18 | IPSL-CM4 | 3.7500N × 2.5000E | 60.0 (26.5–113.7) | −9.5 (−16.2–−0.66) | 1543 (1203–1776) | 629 (76–1364) |
| 19 | MIROC3.2(hires) | 1.1250N × 1.1250E | 63.2 (29.0–117.8) | −8.4 (−15.1–0.25) | 1761 (1377–2032) | 495 (46–1148) |
| 20 | MIROC3.2(medres) | 2.8125N × 2.8125E | 57.7 (24.5–111.2) | −9.3 (−15.7–−0.88) | 1797 (1425–2072) | 707 (93–1535) |
| 21 | MRI-CGCM2.3.2 | 2.8125N × 2.8125E | 50.2 (18.4–101.2) | −10.9 (−17.3–−2.6) | 1640 (1304–1886) | 683 (119–1408) |
| 22 | PCM | 2.8125N × 2.8125E | 46.6 (15.8–97.2) | −10.9 (−17.1–−2.5) | 1517 (1176–1748) | 661 (135–1348) |
| 23 | UKMO-HadCM3 | 3.7500N × 2.5000E | 65.6 (31.7–120.0) | −8.5 (−14.9–−0.17) | 1740 (1381–2004) | 604 (57–1404) |
| 24 | UKMO-HadGEM1 | 1.8750N × 1.2500E | 60.3 (27.2–113.7) | −9.6 (−15.8–−1.3) | 1478 (1174–1692) | 662 (96–1489) |