

Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- ☐ ☒ The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement
- ☒ ☐ A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
- ☐ ☒ The statistical test(s) used AND whether they are one- or two-sided
Only common tests should be described solely by name; describe more complex techniques in the Methods section.
- ☒ ☐ A description of all covariates tested
- ☒ ☐ A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
- ☐ ☒ A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
- ☐ ☒ For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
Give P values as exact values whenever suitable.
- ☒ ☐ For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
- ☒ ☐ For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
- ☒ ☐ Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection The publicly available cloud computation platform Google Earth Engine was used for the collection of the NASA GLDAS-2.1 data, the ECMWF ERA5 data, the NASA FLDAS data, and the NCEP CFSV2 data.

Data analysis Code used for the analysis is available from <https://doi.org/10.6084/m9.figshare.22650760.v1>.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

The historical and current population distribution data are available from the HYDE 3.2 database at <https://landuse.sites.uu.nl/datasets/>. The WorldClim v1.4 data are available at <https://doi.org/10.5061/dryad.fj6q573q7>. The CRU TS v.4.05 and v.4.06 monthly data are available at <https://crudata.uea.ac.uk/cru/data/hrg/>. The NASA GLDAS-2.1 3-hourly data are available at https://developers.google.com/earth-engine/datasets/catalog/NASA_GLDAS_V021_NOAH_G025_T3H. The ECMWF ERA5 daily data are available at https://developers.google.com/earth-engine/datasets/catalog/ECMWF_ERA5_DAILY. The bias-corrected wet bulb temperature data are available at <https://cds.climate.copernicus.eu/cdsapp#!/dataset/sis-extreme-indices-cmip6>. The ECMWF ERA5-Land monthly data are available at https://developers.google.com/earth-engine/datasets/catalog/ECMWF_ERA5_LAND_MONTHLY. The NASA FLDAS monthly data are available at https://developers.google.com/earth-engine/datasets/catalog/NASA_FLDAS_NOAH01_C_GL_M_V001. The NCEP CFSV2 6-hourly data are available at <https://>

developers.google.com/earth-engine/datasets/catalog/NOAA_CFSV2_FOR6H. The downscaled CMIP6 climate data are available from WorldClim v2.0 at <https://worldclim.org>. The SSP population projection data are available at <https://www.cgd.ucar.edu/iam/modeling/spatial-population-scenarios.html>. The GIS data for country boundaries from the World Borders Dataset are available at https://thematicmapping.org/downloads/world_borders.php. The poverty data for 2019 from the World Bank's Poverty and Inequality Platform are available at <https://pip.worldbank.org/home>. All data generated during this study are available from <https://doi.org/10.6084/m9.figshare.22650361.v1>.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	A data and model output based study of the distribution of human population density with respect to mean annual temperature and precipitation up to present and under future projections, with additional analyses of country-level exposure.
Research sample	No research sample in the sense described (all people on the planet considered in the analysis).
Sampling strategy	No corresponding sampling strategy.
Data collection	Data obtained by Chi Xu from public datasets for human population and climate scenarios.
Timing and spatial scale	Timing of data collection not relevant as the data sources already existed and are archived.
Data exclusions	No data were excluded from the analyses
Reproducibility	No experiments were undertaken
Randomization	No allocation into groups as this is a global analysis
Blinding	Blinding not relevant as global analysis
Did the study involve field work?	☐ Yes ☒ No

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging