

Reporting Summary

Nature Portfolio 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 Portfolio 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 We used open-sourced datasets from IPUMS-NHGIS, FrackTracker Alliance, and PHMSA to collect the data used in this study.

Data analysis We used R (Version 4.4.2) and ArcGIS Pro (Version 3.3.0) to analyze the data used in this study.

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 Portfolio [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 description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

A complete dataset including the demographic data and the CO2 pipeline routes is publicly available as an ArcGIS Online Web Map at: <https://arcg.is/1LS8Sj2>

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender	Not applicable--no human participants.
Reporting on race, ethnicity, or other socially relevant groupings	We used IPUM-NHGIS's 2017-2021 five-year estimates of the American Community Survey for socially relevant categorization variables in our study. We classify marginalized groups as low-income populations, non-white racial groups, lowly formally educated communities, areas with vacant or rented properties, and rural areas.
Population characteristics	Not applicable--no human participants.
Recruitment	Not applicable--no human participants.
Ethics oversight	Not applicable--no human participants.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

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	The study examines demographic disparities in CO ₂ pipeline locations and their environmental justice implications. It uses a quantitative approach to analyze existing, proposed, and 2030 projected pipeline networks and their spatial correlation with different demographic communities.
Research sample	The spatial dataset includes census tracts from different CO ₂ pipeline networks across the continental United States, such as the existing pipeline network (3,051 tracts), proposed pipeline network (1,341 tracts), and 2030 projected pipeline network (20,911 tracts). Only census tracts in counties that had an existing, proposed, or projected pipeline were included in our analysis. The demographic dataset includes census tract level data on population, housing, race, income, and education related variables from IPUMS-NHGIS. Only demographic data of census tracts in counties that had an existing, proposed, or projected pipeline were included in our analysis. Observations with missing data for our exploratory variables of interest were removed from our analysis.
Sampling strategy	The sampling approach involved selecting census tracts in counties that intersect with CO ₂ pipeline networks. These selections were based on spatial datasets representing different pipeline scenarios (existing, proposed, and 2030 projected routes). The sample size for each pipeline route analysis was determined by the total number of census tracts in the counties that intersected with the respective pipeline network. The existing pipeline route analysis had a sample size of 3,051 census tracts, the proposed pipeline route analysis had a sample size of 1,341 census tracts, and the 2030 projected pipeline route analysis had a sample size of 20,911 census tracts.
Data collection	The study utilizes data from various sources. The spatial data of carbon dioxide pipeline locations was obtained by FracTracker Alliance and PHMSA. The demographic data was obtained by IPUM-NHGIS's 2017-2021 five-year estimates of the American Community Survey.
Timing and spatial scale	The demographic data represented a five-year estimate of the American Community Survey, between 2017 and 2021. The spatial data related to the existing pipeline route was collected as of November of 2023. The proposed pipeline route spatial data used in our study was also last updated in November of 2023. The study further examines the 2030 projected CO ₂ pipeline networks, analyzing their spatial distribution—this projection was published in a 2021 Net Zero American Final Report from Princeton University.
Data exclusions	The dataset includes only census tracts within counties that interest the three CO ₂ pipeline networks we analyzed. Observations (census tracts) that had missing values for our demographic variables of interest were excluded from our analysis.
Reproducibility	To verify the reproducibility of the study, we relied on publicly available demographic datasets. Our study can be replicated using demographic data from different time ranges.
Randomization	Not applicable, as the study focuses on preexisting geographic and infrastructural data rather than experimental allocation.
Blinding	Not applicable, as the study involves geospatial analysis rather than blinded experimental conditions.

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
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

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

Plants

Seed stocks

Not applicable.

Novel plant genotypes

Not applicable.

Authentication

Not applicable.