

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 [Authors & Referees](#) 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 (<i>n</i>) 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
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☒ | ☐ 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. <i>F</i> , <i>t</i> , <i>r</i>) with confidence intervals, effect sizes, degrees of freedom and <i>P</i> value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ 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 <i>d</i> , Pearson's <i>r</i>), 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

Data used in this study are from public sources: national databases, international databases, industry reports, and peer-reviewed journals.

Data analysis

This research utilized MatLab (version 2019a) and Excel (version 2011 for mac) software. Documentation can be made available upon request.

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/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 data compiled and used to perform this work, as well as data used to produce the figures, can be found in the Supplementary Information. Raw data inputs may be procured through the referenced literature.

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](https://www.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	Quantitative analysis of greenhouse gas emissions and air pollutant emissions from every stage of concrete and mortar production from raw material acquisition through batching was conducted. This inventory accounts for use of supplementary cementitious material, equipment efficiency, fuel mixes, and strength requirements. Using the distributions determined for data variability and the distributions tabulated based on a quantitative uncertainty matrix, Monte Carlo simulations (n = 10,000) were run to assess GHG emissions and air pollutant emissions for production of one cubic meter of concrete and for one cubic meter of mortar production for each of 13 regions in the world.
Research sample	The study did not involve a sample; it included all countries for which data were available.
Sampling strategy	To facilitate assessment of mixtures proportions, 10 mortar mixtures were selected based on United States code (American Society for Testing Materials C270) specifications and the literature, and 92 concrete mixtures possessing the appropriate strength and mineral admixtures were selected based on the literature.
Data collection	Data used in this study are from public sources: national databases, international databases, industry reports, and peer-reviewed journals.
Timing and spatial scale	Due to the availability of cement and concrete production and trade statistics, data were selected to be as reflective of production in the year 2012 as possible. Depending on data availability, some datasets were from earlier or later years and some data were representative of a subset of regions as opposed to globally representative. These differences, when present, are noted in Supplementary Information.
Data exclusions	No data were excluded from the analysis; if data were not available for specific countries, the absence is noted on figures.
Reproducibility	This study is not based on experimental assessment; therefore, there are no experimental findings to replicate.
Randomization	There were no experimental groups; therefore, there was no assignment to experimental groups.
Blinding	There were no experimental groups; therefore, there was no blinding to group allocation.
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
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

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