

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                                                                                                                                                                                                                                                                           |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> The exact sample size ( <i>n</i> ) for each experimental group/condition, given as a discrete number and unit of measurement                                                                                                                    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly                                                                                                                                    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> The statistical test(s) used AND whether they are one- or two-sided<br><i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i>                                                               |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> A description of all covariates tested                                                                                                                                                                                                                     |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons                                                                                                                                        |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> 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) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> 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<br><i>Give P values as exact values whenever suitable.</i>                     |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings                                                                                                                                                           |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes                                                                                                                                     |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> 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 | The zenodo repository ( <a href="https://doi.org/10.5281/zenodo.10354283">https://doi.org/10.5281/zenodo.10354283</a> ) includes the R code to compile the spatially-resolved global regionalized biodiversity impact assessment (Figure 1) and the MATLAB code to compile the REX3 database and to calculate the results of this study (Figure 2–5). The open-access code can be used to reproduce all results of this study. The folder "matlab code to compile REX3" provides the code to compile the REX3 database. This can also be done by using an earlier exiobase version (e.g., version 3.8.2). For this purpose, the data from EXIOBASE3 ( <a href="https://doi.org/10.5281/zenodo.3583070">https://doi.org/10.5281/zenodo.3583070</a> ) need to be saved into the subfolder Files/Exiobase/, while the data from Eora26 ( <a href="https://worldmrio.com/eora26/">https://worldmrio.com/eora26/</a> ) need to be saved into the subfolder Files/Eora26/bp/. The folder "R code for regionalized BD impact assessment based on LUH2 data and maps (Figure 1)" contains the R code to weight the land use data from the LUH2 dataset with the ecoregion-specific species loss factors from UNEP-SETAC and to create the maps shown in Figure 1 of the study. For this purpose, the data from the LUH2 dataset (transitions.nc, <a href="https://luh.umd.edu/data.shtml">https://luh.umd.edu/data.shtml</a> ) need to be stored in the subfolder "LUH2 data". The folder "matlab code to calculate MRIO results (Figure 2-5)" contains the matlab code to calculate the MRIO Results for Figures 2-5 of the study. The folder "R code to illustrate sankeys – Figure 3–5, S11" contains the R code to visualize the flow charts of the research article. |
| Data analysis   | R studio (version 4.3.1) was used to calculate the results on the regionalized biodiversity impact assessment. Matlab (version 2023b) was used to compile the REX3 database and to link land-use change impacts to the shifts in global supply chains using the SCIM method. The results were visualized with Rstudio (version 4.3.1), Tableau Desktop (version 2023.2), and powerpoint (version 16.78.3).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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](#)

Further results of this study are presented in the Supplementary Information (SI\_Biodiversity\_LUC.pdf). The data of the figures presented in this study are attached to the SI (SI\_Results.xlsx). The Source Data of all figures can be downloaded here: <https://www.dropbox.com/scl/fo/fxj4jppqvudizlj27j4q3/AJYFo3TUQLWgkDlwmCWDtg0?rkey=81uctpur94p76scrm3upg2s&st=cb8h4l40&dl=0>. The data on land-use change are retrieved from the Land-Use Harmonization 2 dataset (LUH2, <https://luh.umd.edu/data.shtml>) from Hurtt et al (from 1995 to 2015) and Chini et al with updates up to 2022. The biodiversity impact assessment is based on the ecoregion-specific global species loss factors on land occupation from UNEP-SETAC ([https://www.lc-impact.eu/EQland\\_stress.html](https://www.lc-impact.eu/EQland_stress.html)). The Resolved EXIOBASE version 3 (REX3, <https://doi.org/10.5281/zenodo.10354283>) is based on the approach from Cabernard & Pfister to merge EXIOBASE3 (version 3.8) with Eora26 and integrate production data from FAOSTAT and bilateral trade data from the BACI database. The zenodo repository to download REX3 contains the data for the year 1995 to 2022 (<https://doi.org/10.5281/zenodo.10354283>). REX3 is open access under the Creative Commons Attribution 4.0 International License and can be used to assess the environmental impacts within global supply chains. While Exiobase version 3.8.2 (<https://zenodo.org/records/5589597>) was used for this study, the REX3 database shared in the zenodo repository is based on Exiobase version 3.8 (<https://zenodo.org/records/4277368>), as this is the earliest exiobase version that can be still shared via a Creative Commons Attribution 4.0 International License.

## Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research](#).

Reporting on sex and gender

Population characteristics

Recruitment

Ethics oversight

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](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

This study i) assesses spatially-resolved global biodiversity impacts resulting from land-use conversions between 1995 and 2022 and ii) identifies how shifts in supply chains contribute to land-use change impacts over time. To achieve these goals, we combine the Land-Use Harmonization 2 (LUH2) dataset, providing global land conversions from 1995 to 2022, with ecoregion-specific global species loss factors from UNEP-SETAC. This approach allows us to assess both increases in biodiversity impacts due to natural habitat conversion (e.g., deforestation or other natural habitat conversion for agriculture) and decreases in biodiversity impacts from restoration measures (e.g., reforestation or abandonment of agricultural land) at a high spatial resolution (15-minute arc resolution, approximately 28 km). To consider the diminished quality of secondary compared to primary habitats, land converted from primary habitat to agriculture was assigned a higher biodiversity impact than the decrease in biodiversity impacts by land abandonment of the same area. We integrate this regionalized impact assessment into Resolved EXIOBASE3 (REX3, <https://doi.org/10.5281/zenodo.10354283>), a highly-resolved MRIO database that incorporates production and bilateral trade data of agricultural goods (189 countries x 163 sectors). Finally, we introduce a marginal allocation into MRIO to provide a more nuanced understanding of the dynamic relationship between shifts in global supply chains and recent land-use change impacts.

Research sample

Sampling strategy

Data collection

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data collection                   | and Chini et al with updates up to 2022. The biodiversity impact assessment is based on the ecoregion-specific global species loss factors on land occupation from UNEP-SETAC. The Resolved EXIOBASE version 3 (REX3) is based on the approach from Cabernard & Pfister to merge EXIOBASE324 (version 3.8) with Eora26 and integrate production data from FAOSTAT and bilateral trade data from the BACI database. |
| Timing and spatial scale          | The study covers the period from 1995 to 2022.                                                                                                                                                                                                                                                                                                                                                                     |
| Data exclusions                   | No data were excluded.                                                                                                                                                                                                                                                                                                                                                                                             |
| Reproducibility                   | The MATLAB and R code to compile the REX3 database and calculate the results of this study is available upon zenodo: <a href="https://doi.org/10.5281/zenodo.10354283">https://doi.org/10.5281/zenodo.10354283</a> (will be open access after publication of the research article) and can be used to reproduce the results of this study.                                                                         |
| Randomization                     | No randomization was performed.                                                                                                                                                                                                                                                                                                                                                                                    |
| Blinding                          | No blinding was performed.                                                                                                                                                                                                                                                                                                                                                                                         |
| Did the study involve field work? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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    |                                                        | Methods                             |                                                 |
|-------------------------------------|--------------------------------------------------------|-------------------------------------|-------------------------------------------------|
| n/a                                 | Involved in the study                                  | n/a                                 | Involved in the study                           |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Antibodies                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> ChIP-seq               |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Eukaryotic cell lines         | <input checked="" type="checkbox"/> | <input type="checkbox"/> Flow cytometry         |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Palaeontology and archaeology | <input checked="" type="checkbox"/> | <input type="checkbox"/> MRI-based neuroimaging |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Animals and other organisms   |                                     |                                                 |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Clinical data                 |                                     |                                                 |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Dual use research of concern  |                                     |                                                 |