nature portfolio

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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 use open-source software developed in SEPAL (https://sepal.io all code available at https://github.com/openforis/sepal), Google Earth Engine, R (version 4.2.1 from 2022-06-23) and Python (version 3.8.10)
Data analysis	we use open-source software developed in SEPAL (https://sepal.io all code available at https://github.com/openforis/sepal), Google Earth Engine, R (version 4.2.1 from 2022-06-23) and Python (version 3.8.10) in addition to arcGIS Pro (version 2.9.3) and QGIS (version 3.22.7)

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

all spatial and tabular data developed by the project is accessible via the online database as Google Earth Engine Assets and via arcGIS Online: https://congo.dddafrica.info/resultats/base_donnees, and also available in the Central Africa Forest Observatory (OFAC) library : https://www.observatoire-comifac.net/library

Human research participants

Policy information about studies involving human research participants and Sex and Gender in Research.

Reporting on sex and gender	*Use the terms sex (biological attribute) and gender (shaped by social and cultural circumstances) carefully in order to avoid confusing both terms. Indicate if findings apply to only one sex or gender; describe whether sex and gender were considered in study design whether sex and/or gender was determined based on self-reporting or assigned and methods used. Provide in the source data disaggregated sex and gender data where this information has been collected, and consent has been obtained for sharing of individual-level data; provide overall numbers in this Reporting Summary. Please state if this information has not been collected. Report sex- and gender-based analyses where performed, justify reasons for lack of sex- and gender-based analysis.*
Population characteristics	*Describe the covariate-relevant population characteristics of the human research participants (e.g. age, genotypic information, past and current diagnosis and treatment categories). If you filled out the behavioural & social sciences study design questions and have nothing to add here, write "See above."*
Recruitment	*Describe how participants were recruited. Outline any potential self-selection bias or other biases that may be present and how these are likely to impact results.*
Ethics oversight	*Identify the organization(s) that approved the study protocol.*

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	We use satellite imagery to evaluate the trends in deforestation, degradation in Congo Basin Forests from 2015-2020, and the associated direct drivers.
Research sample	We estimate areas of annual deforestation, degradation through the analysis of a stratified random sampling to select 359,978 unique points throughout the study area according to the area of the strata. This approach for map validation follows best practices to achieve a desired confidence internal of 0.05. Of these, 12,260 are evaluated for forest type, type of change, date of change and presence of direct driver through visual interpretation. The rest were assessed via a consensus approach using available and auxiliary data.
Sampling strategy	We selelected at minimum 150 samples per map class, with more samples according to the area of the map strata.
Data collection	Data were obtained from analysis of freely available satellite imagery provided by USGS and Planet. Data were analyzed by the article co-authors using algorithms provided in the SEPAL (https://sepal.io) platform.
Timing and spatial scale	The timing of the study is from January 1, 2015-December 31, 2020. Baseline data were evaluated for the year 2015 using a combination of different satellite sensors including Landsat, Sentinel 1, ALOS Palsar due to availability and coverage with all products resampled to 30m resolution. Change detection was assessed for the period from January 1, 2016 to December 31, 2020 using Landsat imagery at 30m resolution, which has a 14-day revisit time consistently over the study area and time period. For validation, 5m image mosaics available at 6 month intervals between 2015 and 2020, with monthly mosaics available from June, 2020 onward.

Data exclusions	We limit our analysis to areas within the national boundaries defined by the Large Scale International Boundaries (LSIB) dataset. Any areas outside these limits were excluded.
Reproducibility	All scripts and procedures were documented step-by-step with screenshots on a public website (https://congo.dddafrica.info/) and all scripts shared via github.
Randomization	The samples selected for validation were selected entirely randomly within the map strata.
Blinding	We use an online interface for validation of point data, for which the map strata and results analysis are not shared to the user, preventing bias.

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

Methods

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