# HARMONIZE

## land4health

HARMONIZE 4health Toolkit Training - November 2025

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# Team

InnovaLab

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Gabriel Carrasco
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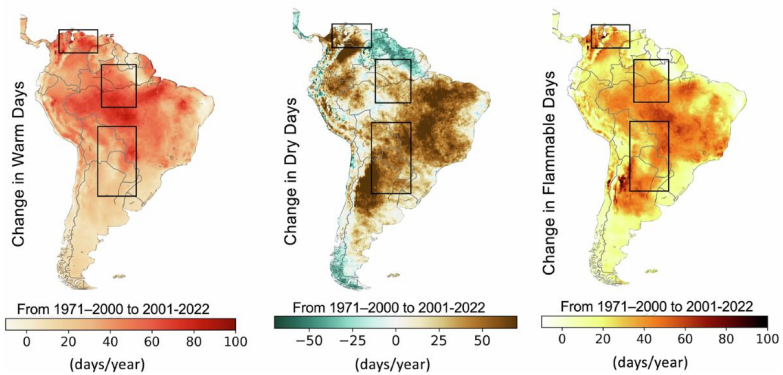
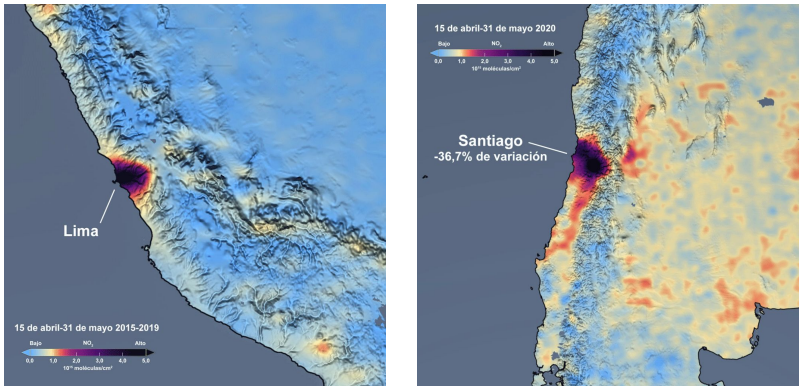
# How do we connect and visualize data?




S. Feron *et al.*, "South America is becoming warmer, drier, and more flammable," *Communications Earth & Environment*, vol. 5, no. 1, Sep. 2024, doi: https://doi.org/10.1038/s43247-024-01654-7.

Integrating these multiple indicators remains a **persistent challenge**

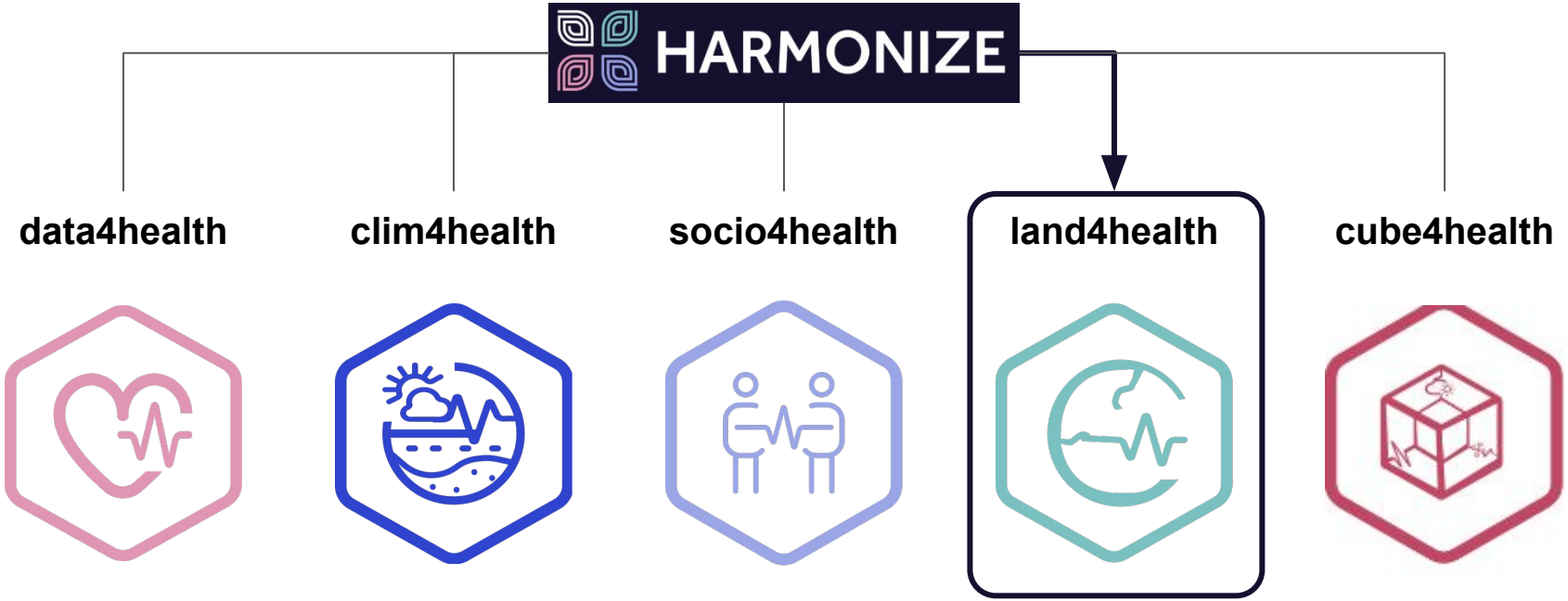
We often rely on **maps** to make environmental **change visible**




T. L. Schindler, B. Duncan, and K. Mersmann, "NO2 Decline Related to Restrictions Due to COVID-19 in South America," *NASA Scientific Visualization Studio*, Jun. 18, 2020. https://svs.gsfc.nasa.gov/4835/ (accessed Oct. 27, 2025).

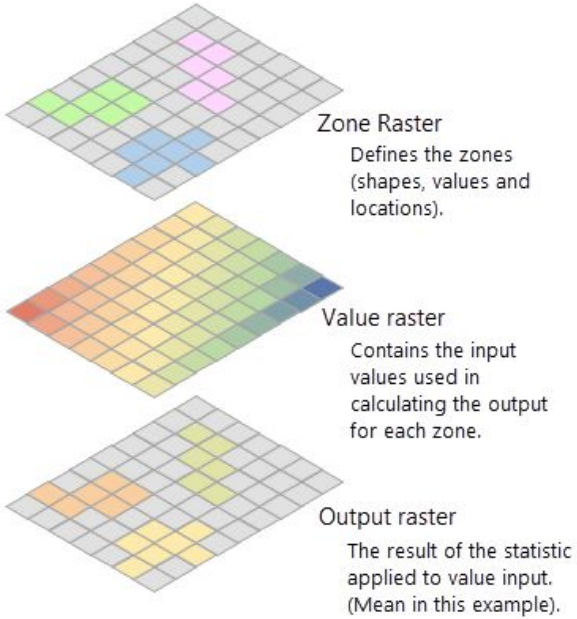
## What is land4health?

A package that offers R users a quick and easy way to obtain **zonal statistics** of key indicators and covariates, ideal for modeling infectious diseases within the framework of spatial epidemiology



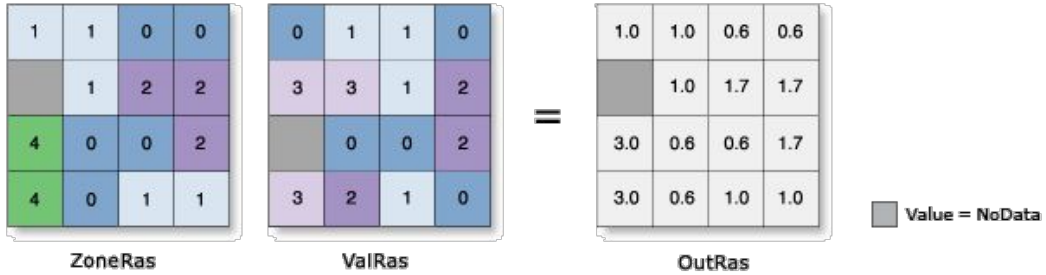
# Why do we need zonal statistics?

Zonal statistics **transform** raw pixels into interpretable, territory-based information.




**IMPORTANT!!!**

- **Bridges scales:** links satellite pixels to administrative or health areas.
- **Makes data comparable:** generates aggregated indicators (mean, sum, variance).
- **Simplifies complexity:** turns thousands of pixels into one value per zone.
- **Connects environment and health:** links climate and land data to disease risk.



# Functions

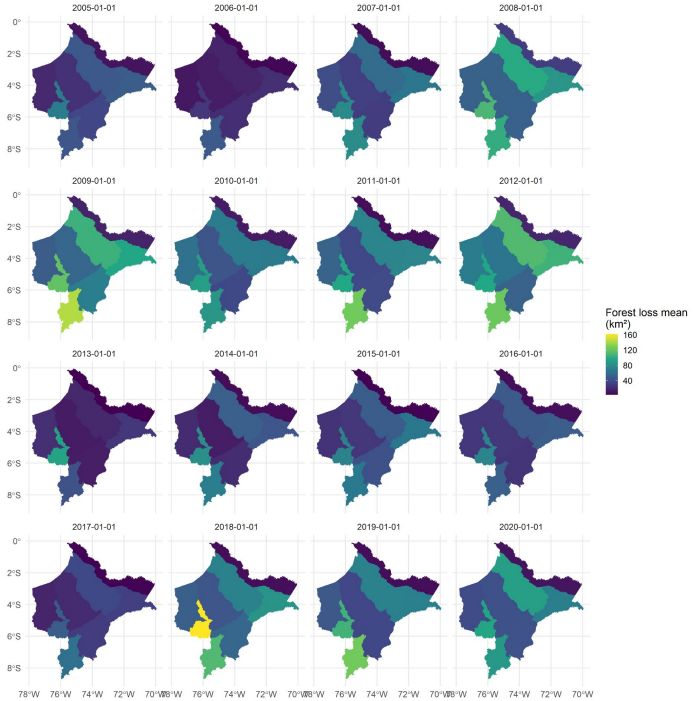
**COMING SOON!!!**

- **l4h_no2:** spatial $NO_2$ concentration.
- **l4h_so2:** satellite-derived $SO_2$ levels.
- **l4h_uav:** high-resolution UAV analysis.
- **l4h_human_modif:** human modification index.
- **l4h_vegetation:** vegetation condition indicators.

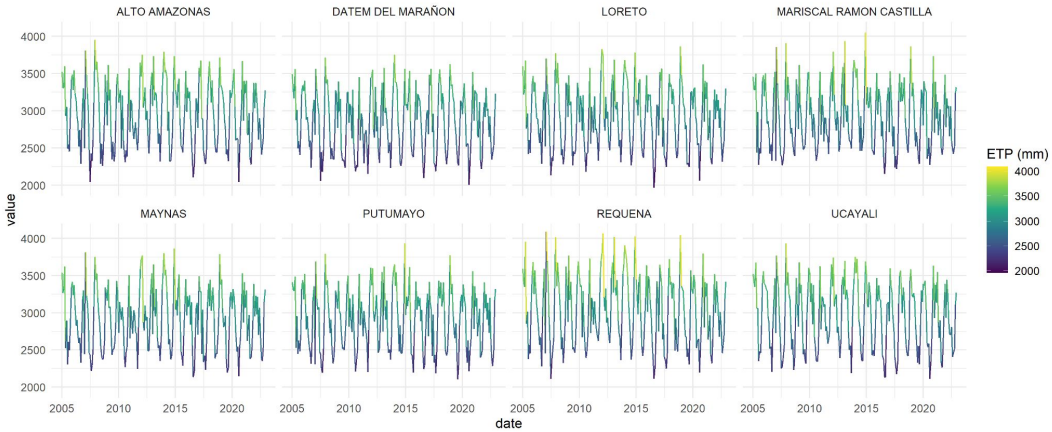
**DECEMBER!**

| Category | n | Details |
|---|---|---|
| **Vector-borne disease** | 2 | l4h_dengue_cases(), l4h_layers_available_malaria() |
| **Human intervention** | 4 | l4h_forest_loss(), l4h_night_lights(), l4h_urban_rural_area(), l4h_human_built() |
| **Accesibility** | 2 | l4h_rural_access_index(), l4h_travel_time() |
| **Enviroment** | 4 | l4h_pm2.5(), l4h_water_proportion(), l4h_co_column(), l4h_urban_heat_index() |
| **Climate** | 3 | l4h_terra_climate(), l4h_sebal_modis(), l4h_surface_temp() |
| **Utils** | 2 | l4h_list_metrics(), l4h_packages() |
| **Total** | **17** | |

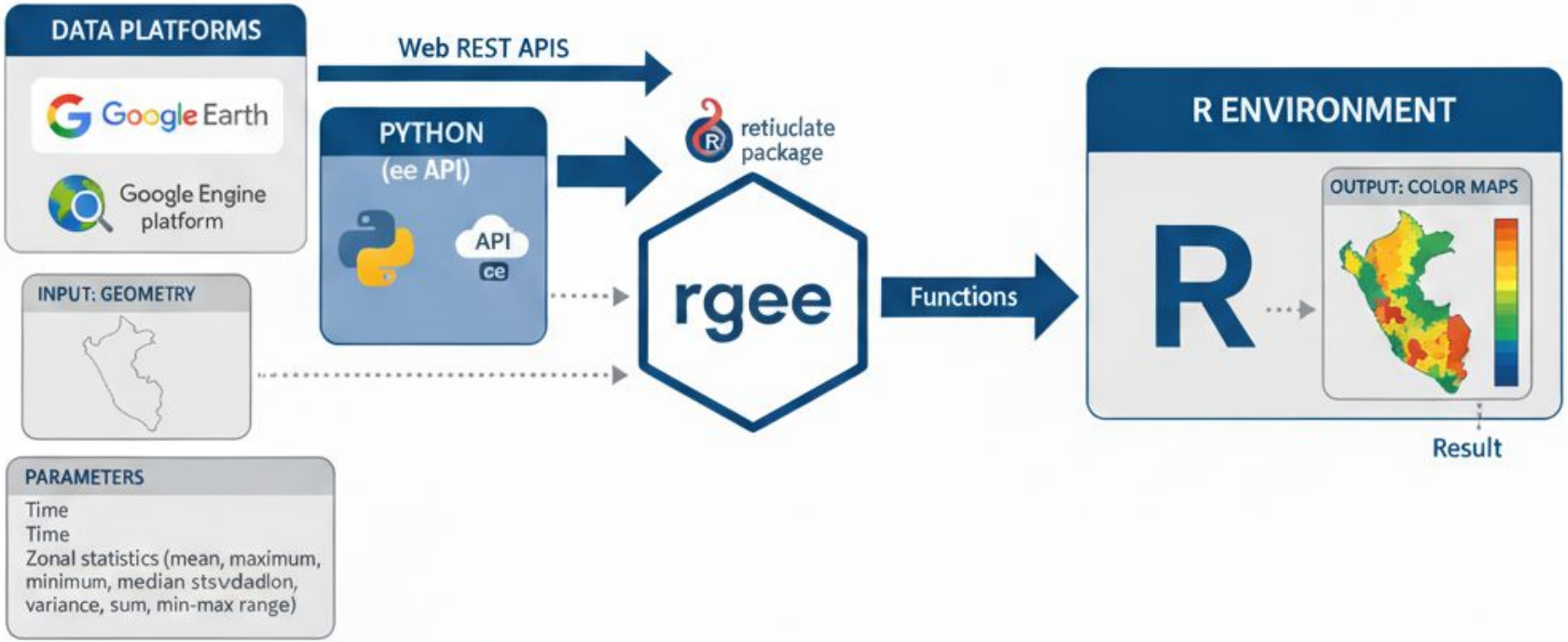
# What can we do with Ian4health?



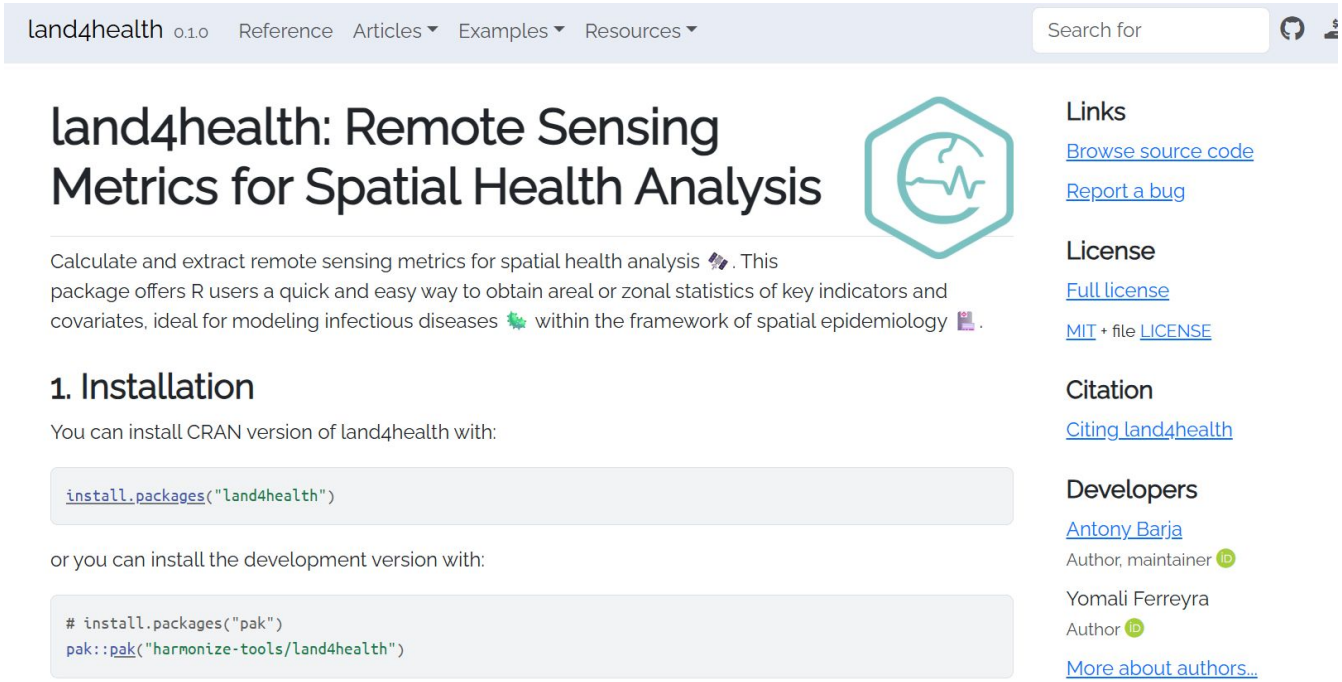

- Annual satellite-based environmental maps.
- Multi-year climate time-series by region.
- Spatial–temporal datasets for modeling.



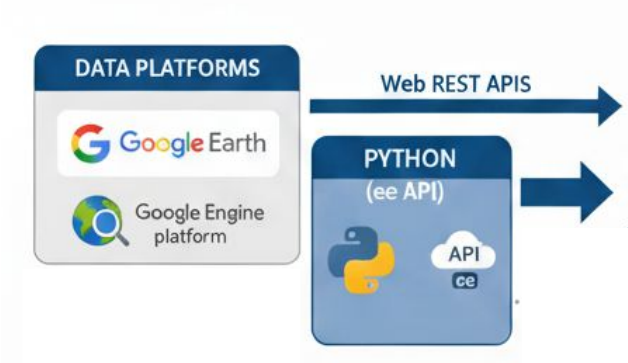
# How land4health works?



# Shall we begin?



# Current limitations

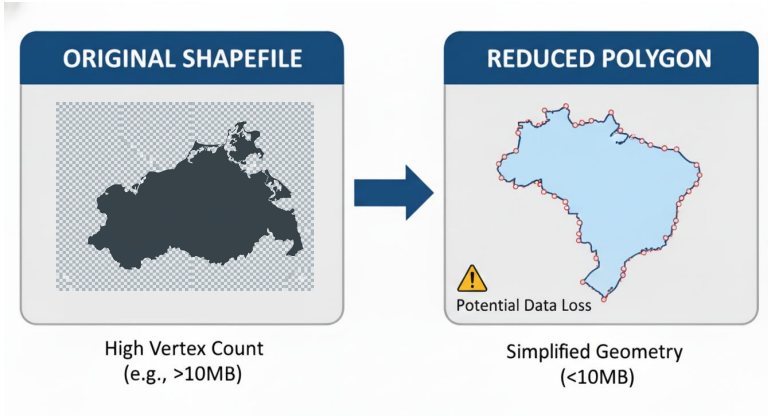



- **Strict compatibility is required between the GEE API version and rgee**; mismatches commonly lead to failures in ee_Initialize()

Dependencies (Python + API + reticulate + credentials) makes the installation and configuration process far from user-friendly

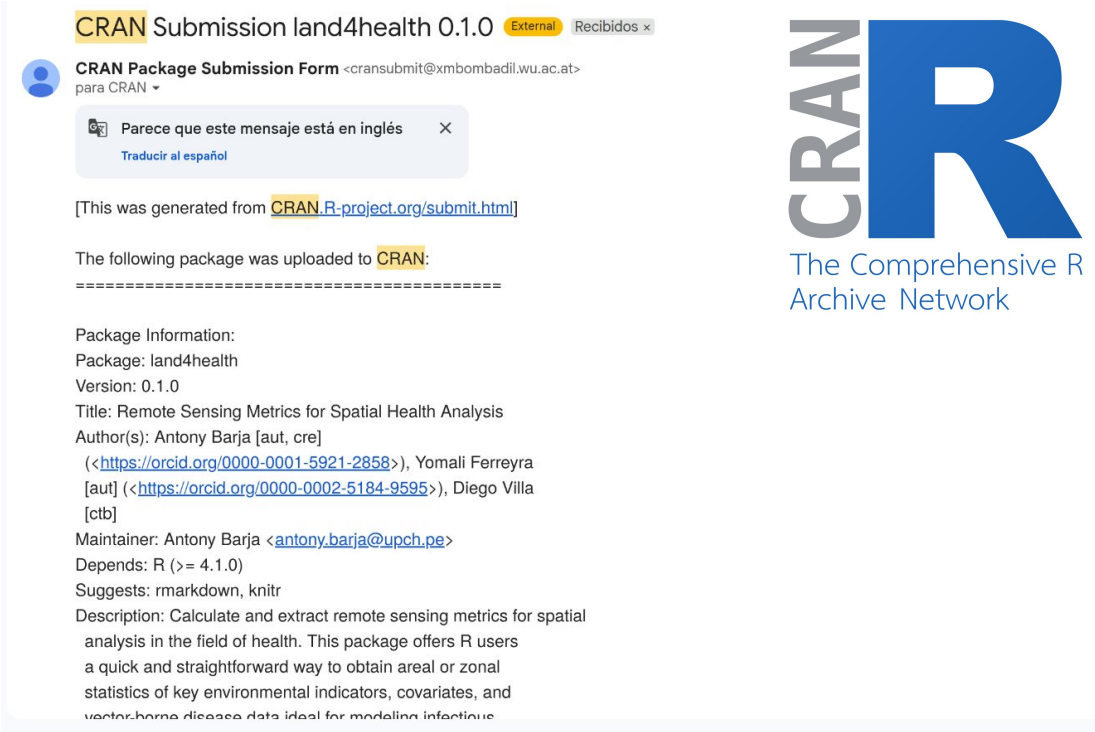
- GEE API does **not allow uploading vector assets larger than 10 MB**, especially shapefiles with **high vertex density** or complex boundaries.

So, polygons must be **simplified or reduced**, decreasing file size. **However, simplification can introduce geometric distortion** and loss of detail



# CRAN submission

**COMING SOON!!!**



CRAN Submission land4health 0.1.0 External Recibidos ×

**CRAN Package Submission Form** <cransubmit@xmbombadil.wu.ac.at>
para CRAN

Parece que este mensaje está en inglés
Traducir al español

[This was generated from CRAN.R-project.org/submit.html]

The following package was uploaded to CRAN:
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Package Information:
Package: land4health
Version: 0.1.0
Title: Remote Sensing Metrics for Spatial Health Analysis
Author(s): Antony Barja [aut, cre]
(<https://orcid.org/0000-0001-5921-2858>), Yomali Ferreyra
[aut] (<https://orcid.org/0000-0002-5184-9595>), Diego Villa
[ctb]
Maintainer: Antony Barja <antony.barja@upch.pe>
Depends: R (>= 4.1.0)
Suggests: rmarkdown, knitr
Description: Calculate and extract remote sensing metrics for spatial
analysis in the field of health. This package offers R users
a quick and straightforward way to obtain areal or zonal
statistics of key environmental indicators, covariates, and
vector-borne disease data ideal for modeling infectious

CRAN
The Comprehensive R Archive Network