Geo-Wiki Citizen Science Campaigns

Recent experiences creating and sharing new reference data sets on land cover and land use

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Novel Data Ecosystems for Sustainability (NODES)
Advancing Systems Analysis program (ASA)

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Geo-Wiki: Online Engagement Platform

- Visual interpretation of VHR satellite imagery

- Short, intensive crowdsourcing campaigns

- Large amounts of data in short time

- Clearly defined targets

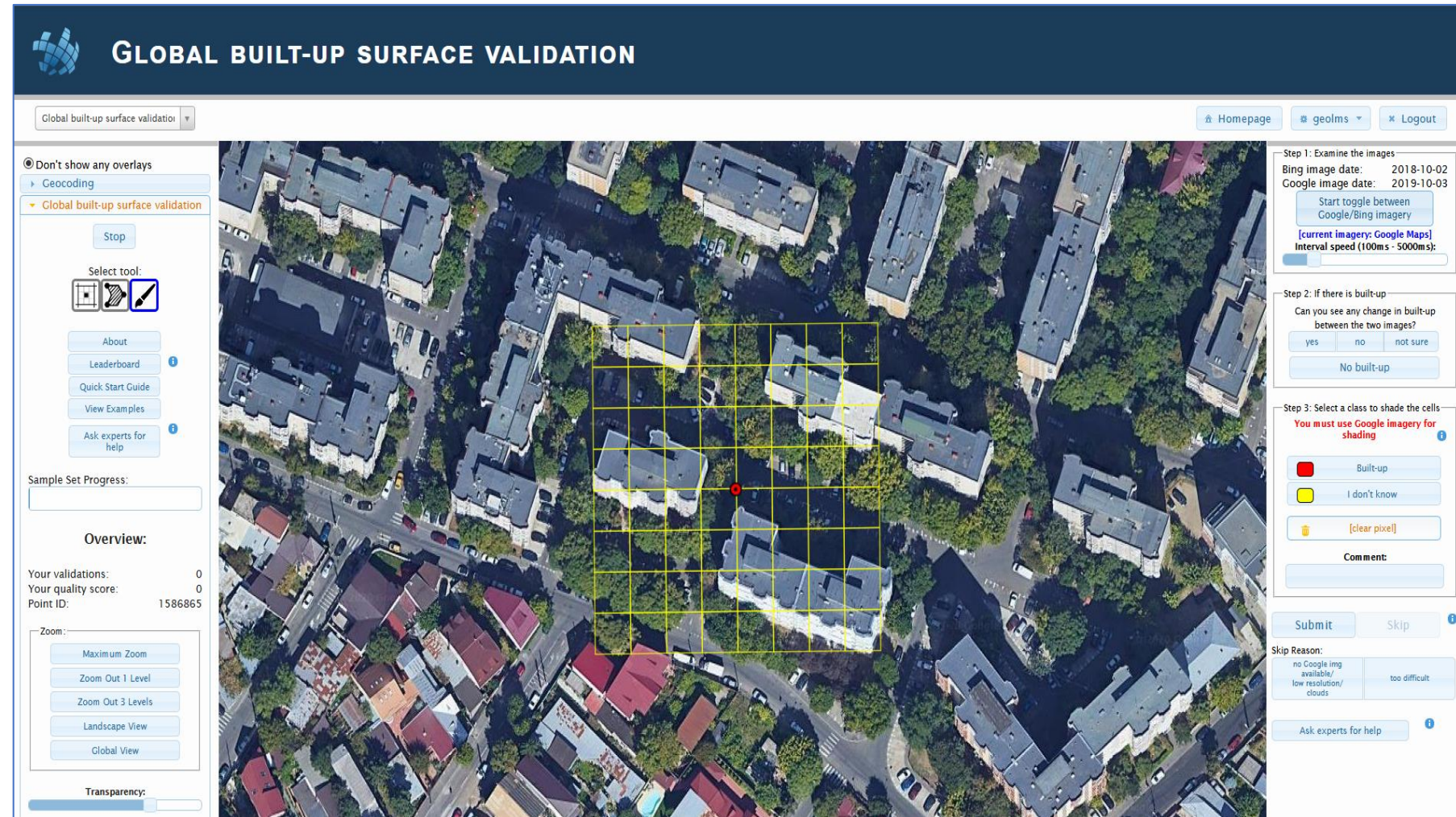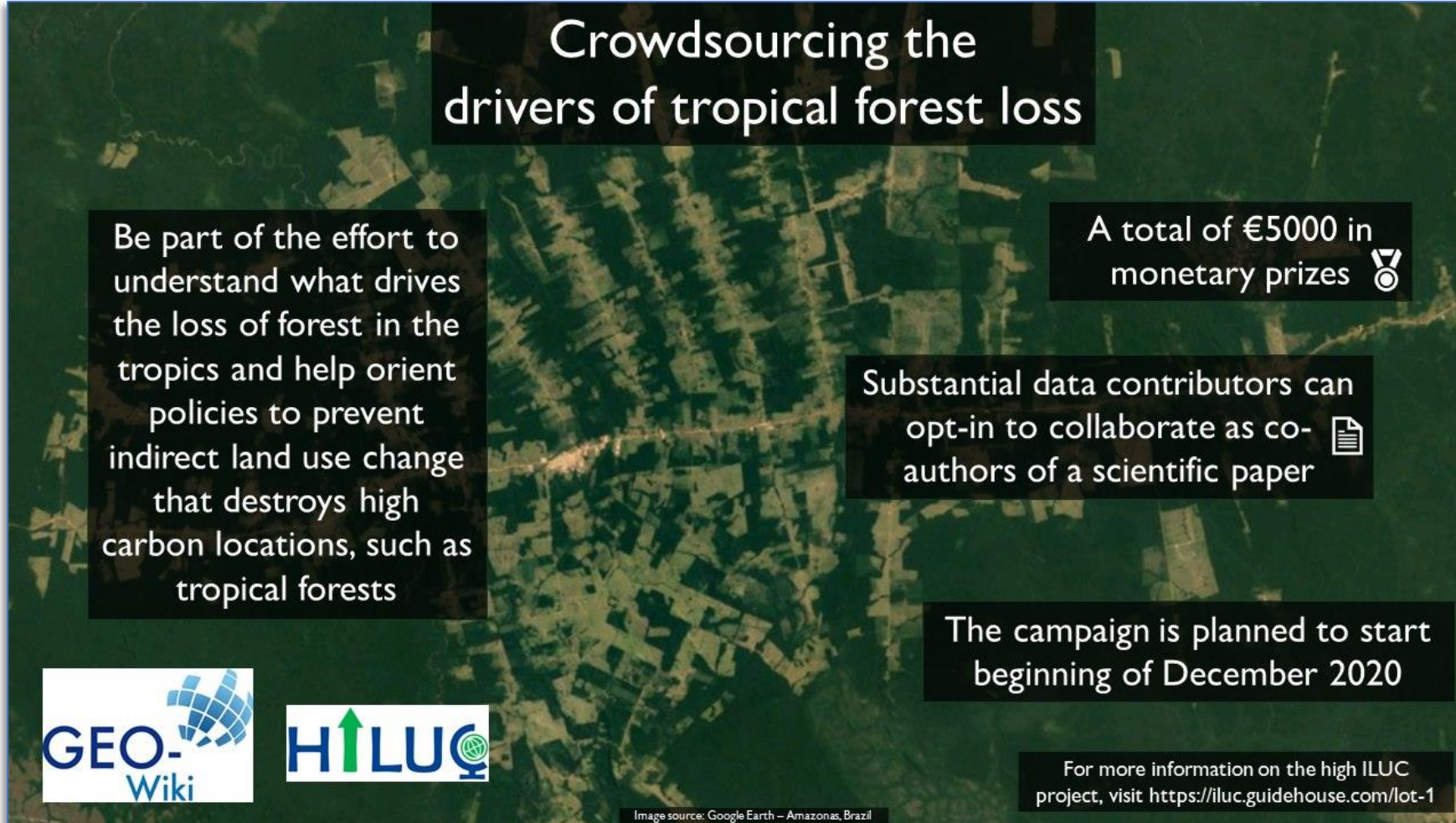- Land use and land cover changes

Figure: Screenshot of the Geo-Wiki interface for one of the latest crowdsourcing campaigns

Geo-Wiki crowdsourcing campaigns

Crowdsourcing the drivers of tropical forest loss

Be part of the effort to understand what drives the loss of forest in the tropics and help orient policies to prevent indirect land use change that destroys high carbon locations, such as tropical forests

A total of €5000 in monetary prizes

Substantial data contributors can opt-in to collaborate as co-authors of a scientific paper

The campaign is planned to start beginning of December 2020

Image source: Google Earth – Amazonas, Brazil

For more information on the high ILUC project, visit https://iluc.guidehouse.com/lot-1

GEO-Wiki

HILUC

Figure: Example of a promotional flyer used in one of the Geo-Wiki campaigns, showing purpose and prizes offered

- Campaigns organized as competitions
- Monetary prizes and opt-in for co-authorship
- Quality of contributions is checked during and after the campaign
- Scientific publication is used to share data
  - Data is uploaded in public repositories
- Approach ensures transparency

Geo-Wiki campaigns: Basic process timeline

Timeline

(1-2 weeks)   (4-8 weeks)   (1-4 weeks)   (4-10 weeks)

Goal definition (project-based)

List of tasks and timeline

UI setup

Setup of expert control points

Promotional and training material
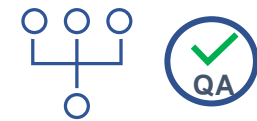
Sampling design

Advertisement

Testing and quality assurance

Campaign

Transfer of prizes to participants

Post campaign data processing and quality assurance

Data and paper public release

1. Global cropland mapping

Cropland
High : 100
Low : 0

Figure: Example of the results from the campaign

Click on each sub-pixel if contains >50% cropland ⓘ

Mark all as Cropland

Clear all sub-pixels

Transparency:

80 participants

144 K+ observations

3 weeks

36 K+ unique locations validated at least 3 times each

- Data in the Pangaea repository: https://doi.pangaea.de/10.1594/PANGAEA.873912
- Paper describing campaign and data in Scientific Data: https://www.nature.com/articles/sdata2017136

2. Global field size

Field size
- • very large
- • large
- • medium
- • small
- • very small

Figure: Example of the results from the campaign
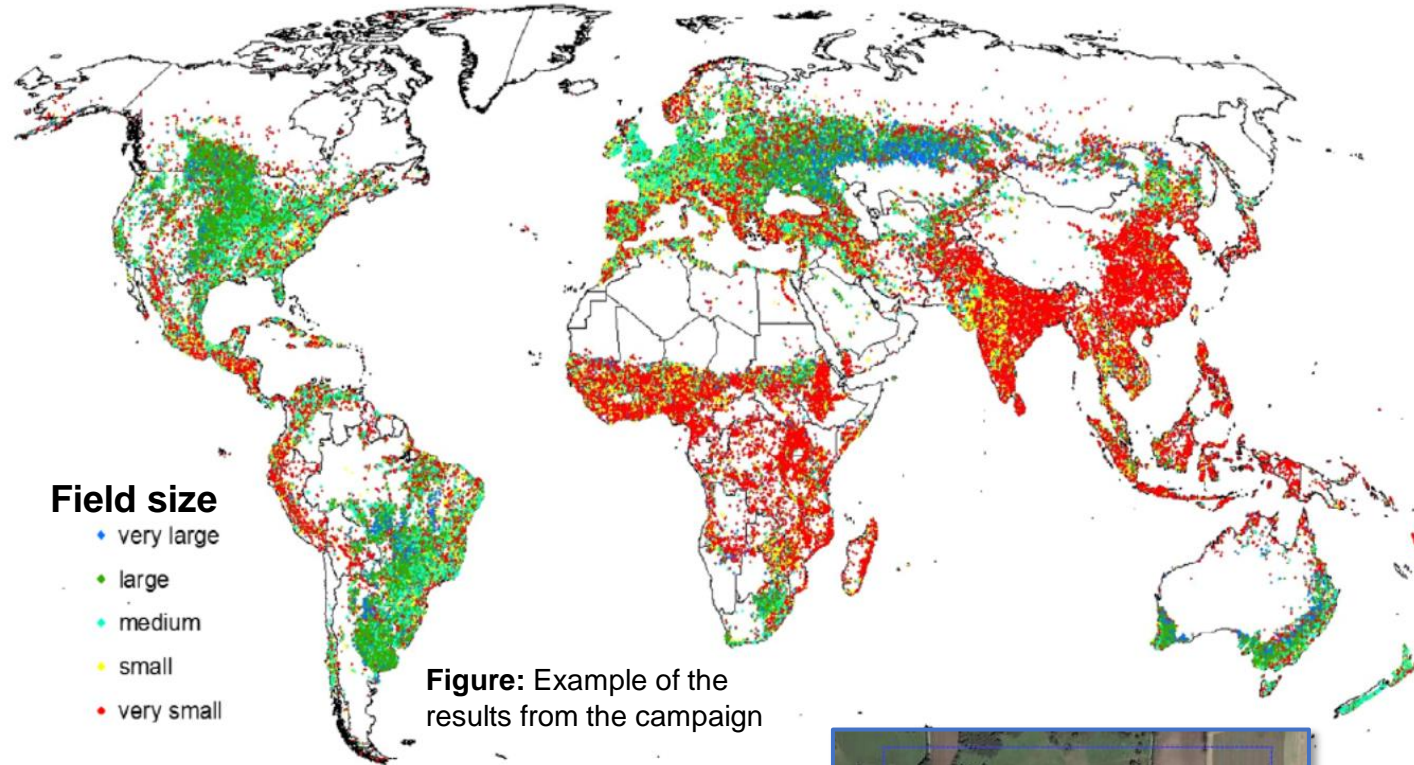
What sizes are the fields ⓘ intersecting with the red box?

If there is more than one field size, indicate which category is dominant.

Very large (>100 ha)	dominant
Large (>16 ha)	dominant
Medium (2.56 ha -16 ha)	dominant
Small (0.64 ha - 2.56 ha)	dominant
Very small (<0.64ha)	dominant
No fields	

130 participants

390 K+ observations   **4** weeks

110 K+ unique locations validated at least 5 times each

- Data published here: https://pure.iiasa.ac.at/id/eprint/15526/
- Paper published in Global Change Biology journal: https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.14492

3. Human impact on forests

Figure: Example of the results from the campaign

Legend:
- forest not disturbed
- forest with human impact near-by
- forest with human impact
- replanted forest
- woody plantation
- palms
- tree shelterbelts
- agroforest
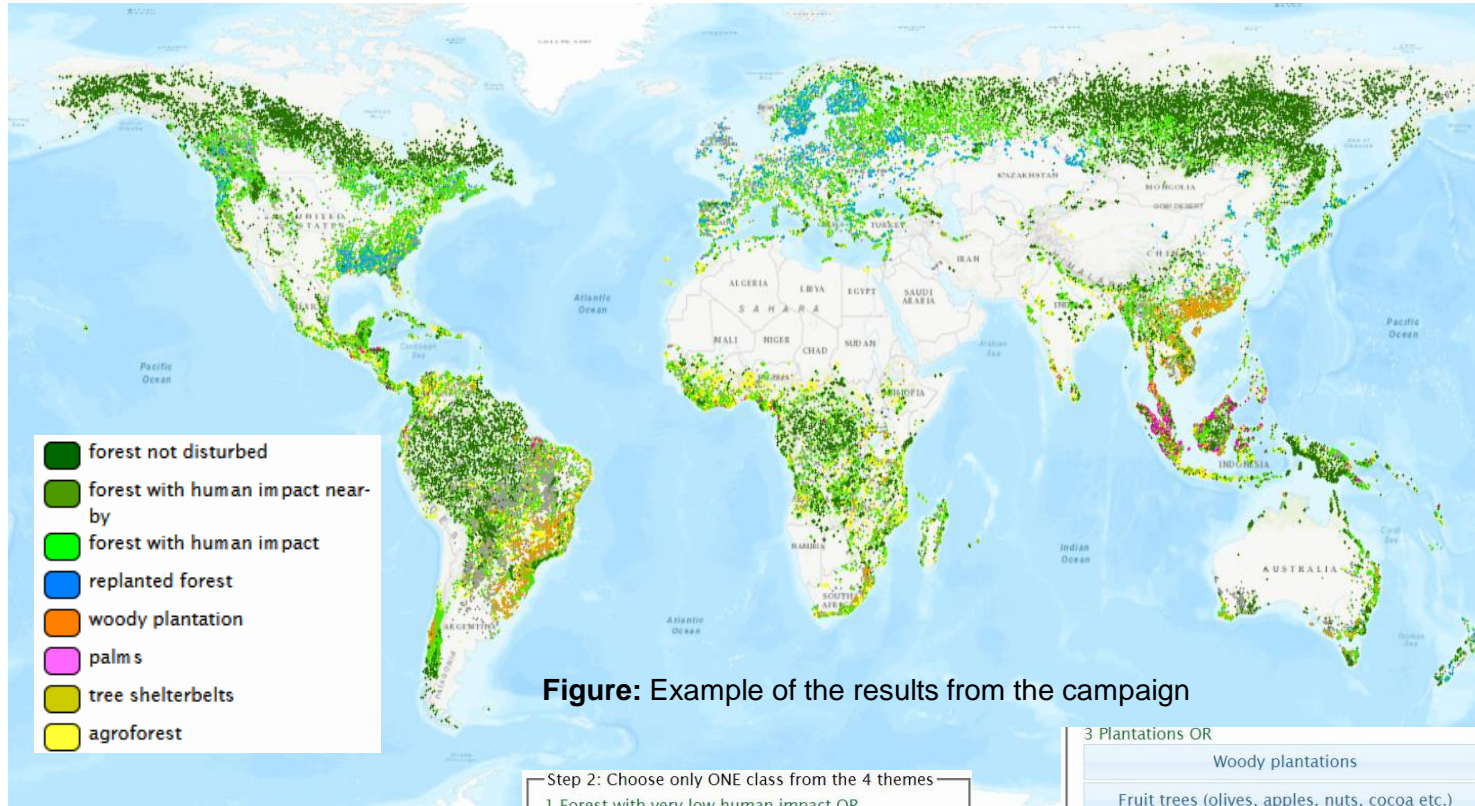
Step 1: Choose age of the tree
- Young
- Middle-aged
- Mature
- Mixed
- No trees

Step 2: Choose only ONE class from the 4 themes

1 Forest with very low human impact OR
- Not disturbed
- With human impact nearby (roads, etc)
- Abandoned crops/pasture
- Degraded or disturbed (fire, wind, insects)

2 Forest with signs of clearcut, selective logging and forest replanting OR
- Naturally regrow forest (incl. selective logging)
- Replanted forest
- Regeneration type is not clear

3 Plantations OR
- Woody plantations
- Fruit trees (olives, apples, nuts, cocoa etc.)
- Oil palm (or other palms)
- Not sure if tree crops or woody plantations

4 Other landscapes
- Tree shelter belts, small forest patches
- Agro-forestry or sparse trees on crop/pasture field
- Shifting cultivation
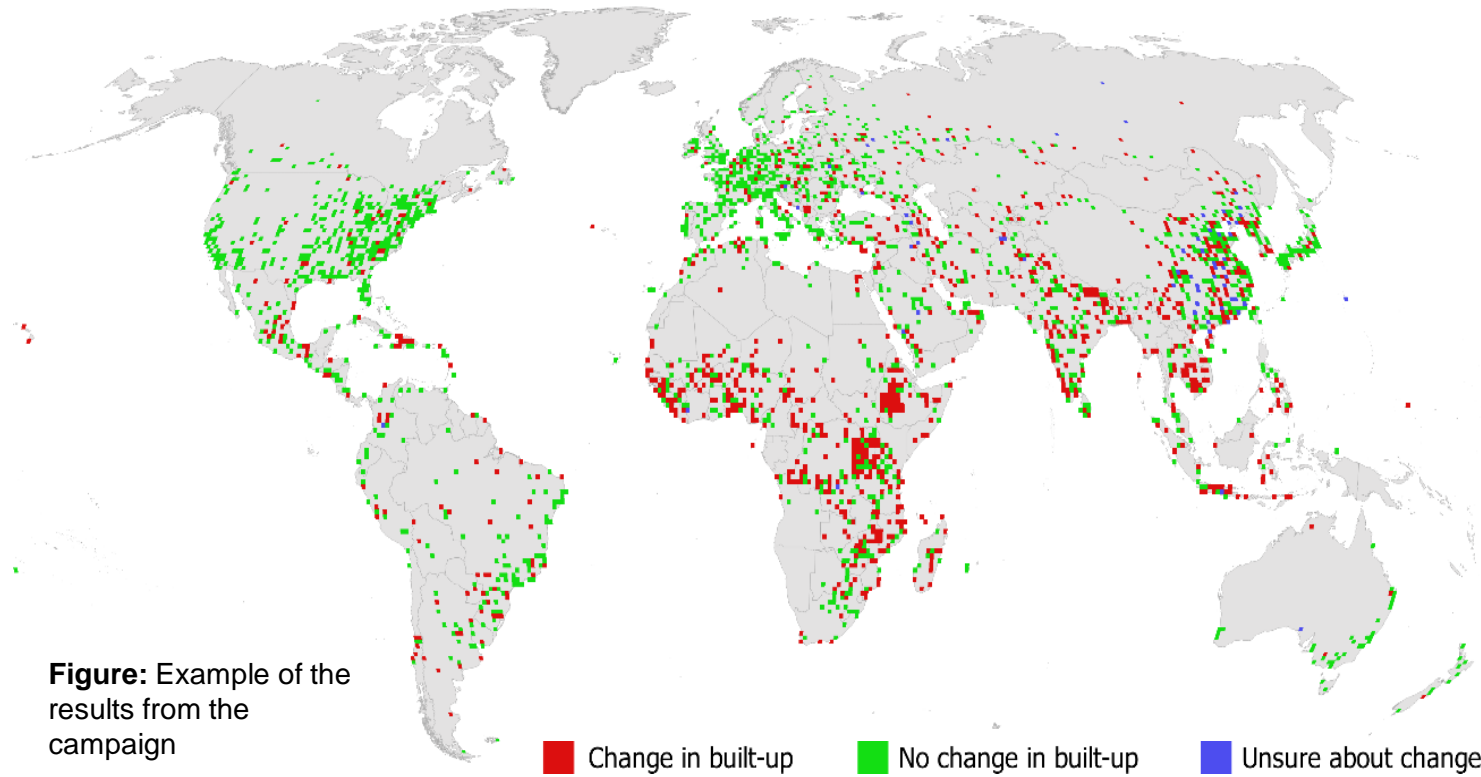- Trees in urban/built-up areas
- None of the above

130 participants

459 K+ observations

7 weeks (4 campaigns)

110 K+ unique locations validated at least 5 times each

- Data are being processed and will be made public soon
- Paper with citizen science co-authors currently under review in Scientific Data journal

4. Global human settlement layer

Figure: Example of the results from the campaign

Change in built-up ■ No change in built-up ■ Unsure about change ■

Step 1: Examine the images
Bing image date: 2018-10-02
Google image date: 2019-10-03
Start toggle between Google/Bing imagery
[current imagery: Google Maps]
Interval speed (100ms - 5000ms):

Step 2: If there is built-up
Can you see any change in built-up between the two images?
yes   no   not sure
No built-up

Step 3: Select a class to shade the cells
You must use Google imagery for shading
Built-up
I don't know
[clear pixel]

61 participants

276 K+ observations

6 days

50 K+ unique locations validated at least 5 times each

- Data published in IIASA-DARE repository:
https://dare.iiasa.ac.at/112/

- Paper with citizen science co-authors currently under review in Scientific Data journal

5. Drivers of tropical forest loss

Global Forest Change tree loss layer
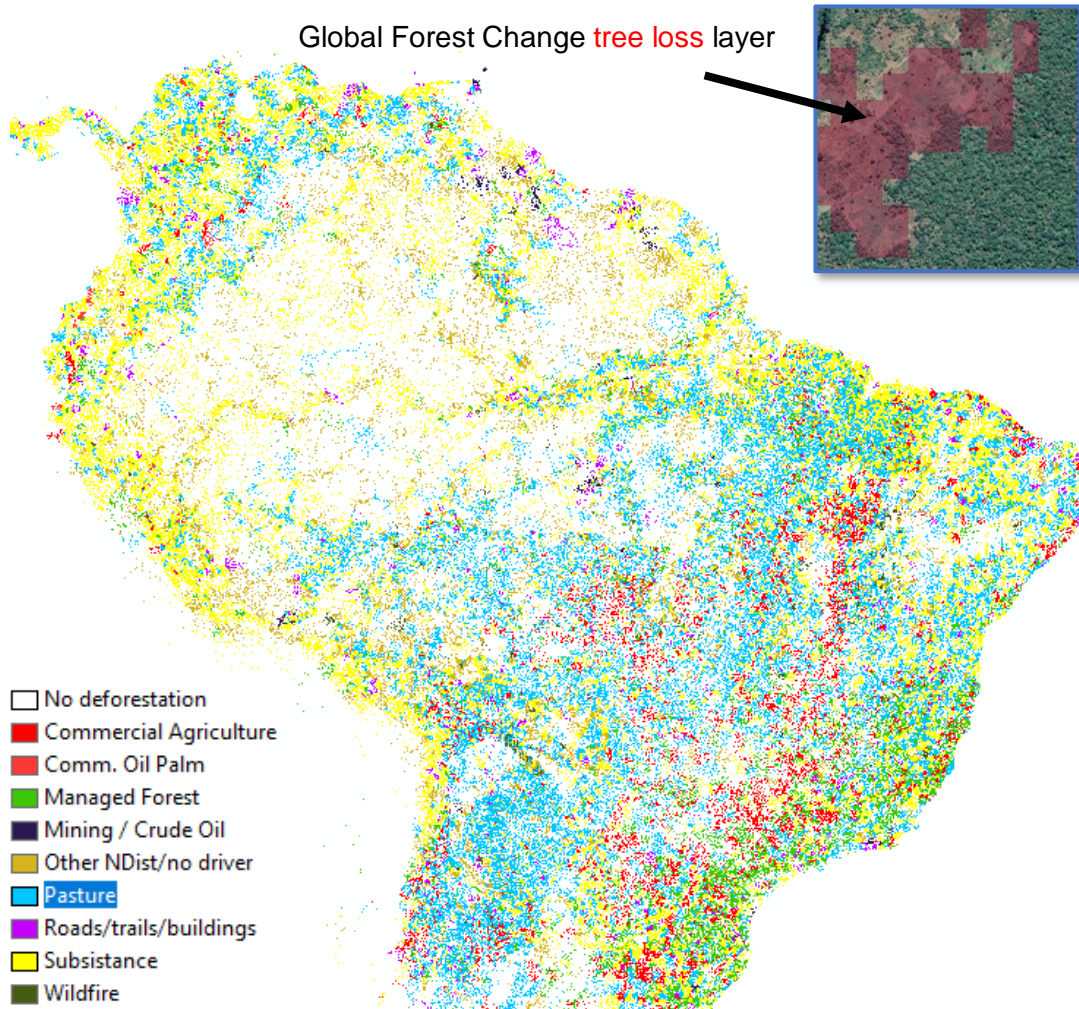
STEP 1:
Please select the **predominant** tree loss driver visible inside the tree loss pixels in the blue box

- Subsistence agriculture
- Commercial agriculture
- Commercial oil palm or other palm plantations
- Pasture
- Managed forest/forestry
- Roads/trails/buildings
- Mining and crude oil extraction
- Wildfire (disturbance)
- Other natural disturbances/No tree-loss driver

STEP 2:
Please select **all other** tree loss drivers visible inside the tree loss pixels in the blue box

- Agriculture/Pasture
- Managed forest/forestry
- Roads/trails/buildings
- Natural disturbances
- No other tree loss driver visible

STEP 3:
Can you see roads, trails or buildings in the blue box

| Yes | No |

Legend:
- ☐ No deforestation
- ■ Commercial Agriculture
- ■ Comm. Oil Palm
- ■ Managed Forest
- ■ Mining / Crude Oil
- ■ Other NDist/no driver
- ■ Pasture
- ■ Roads/trails/buildings
- ■ Subsistance
- ■ Wildfire

Figure: Example of IIASA's Drivers of Tropical Forest Loss (v1) in South America

58 participants

400 K+ observations

2 weeks

120 K+ unique locations validated at least 3 times each

- Data is currently being uploaded to public repository

- Data descriptor paper is being drafted and will be submitted soon

Some lessons learned and some suggestions

- **Planning: Consider the whole process**
  - Technical implementation
  - Promotion
  - Control points, training materials

- **Control points: Amount, effort, representativity (classes/types) and quality checks (e.g., agreement)**
  - Rewards/score: Test the system before and adjust – consider in plan

- **Training of the crowd: Videos, live sequences, chat availability, feedback, webinars, on-the-spot training**
  - Consider multi-lingual support and accessibility: Use images (pictograms) and videos more than words
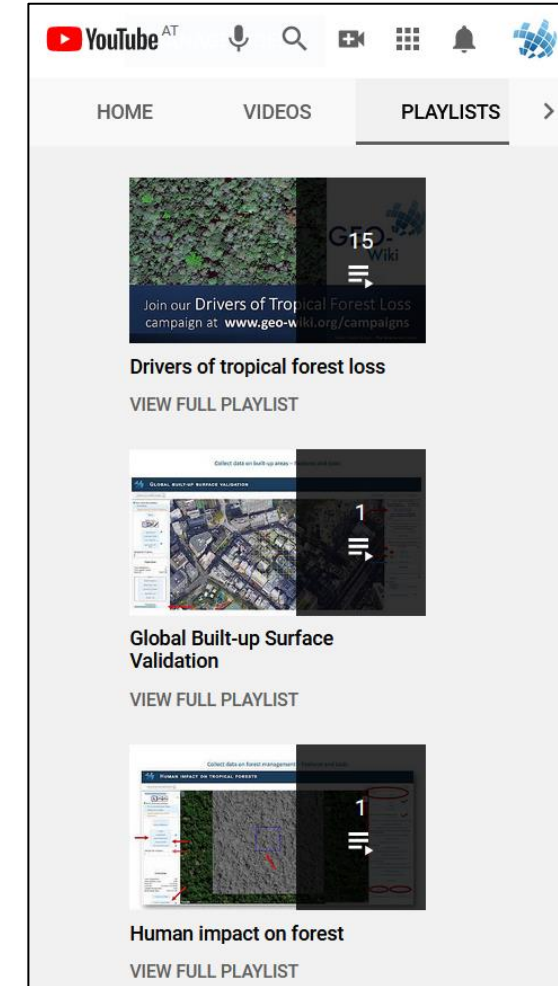
Figures: Training materials for Geo-wiki campaigns

Other lessons learned and suggestions

- Limits of the crowd: Visual interpretation can be hard!
    - Some classes are hard to recognize (even for experts)
    - Different locations/agro-ecological zone = different training
    - Consider allowing people to choose and trade-offs of this choice
    - Simple tasks are most effective – split work into stages
    - Quality is checked in several stages

- Gaming and rewards: Under/over-incentives, automated submissions (bots)
    - Very high prizes lead to creativity (good and bad!)

- Advertisement: maintain and increase user-base

- Technical support: Thinking on lowest access needed
    - Bandwidth, processing power

Figures: Examples of locations for VHR imagery visual interpretation

GEO-Wiki is here

Thank you for your attention

Questions at the chat section or directly (contacts below)

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www.geo-wiki.org