

# Validating maps of land cover and land degradation with citizen science and mobile gaming

Inian Moorthy, Neha Joshi, M Thoha Zulkarnain, Andree Ekadinata, Tobias Sturn, Fathir Mohamad, Bunga Goib, Ping Yowargana, Olha Danylo, Hadi, Ian McCallum, Florian Kraxner, Linda See, Steffen Fritz

International Institute for Applied Systems Analysis



Supported by:



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

# Motivation

**Improve earth observation-based land cover and land degradation maps with context-specific data streams using crowdsourcing**

## **Why Crowdsourcing?**

**Low-cost solutions**

**Up-to-date information**

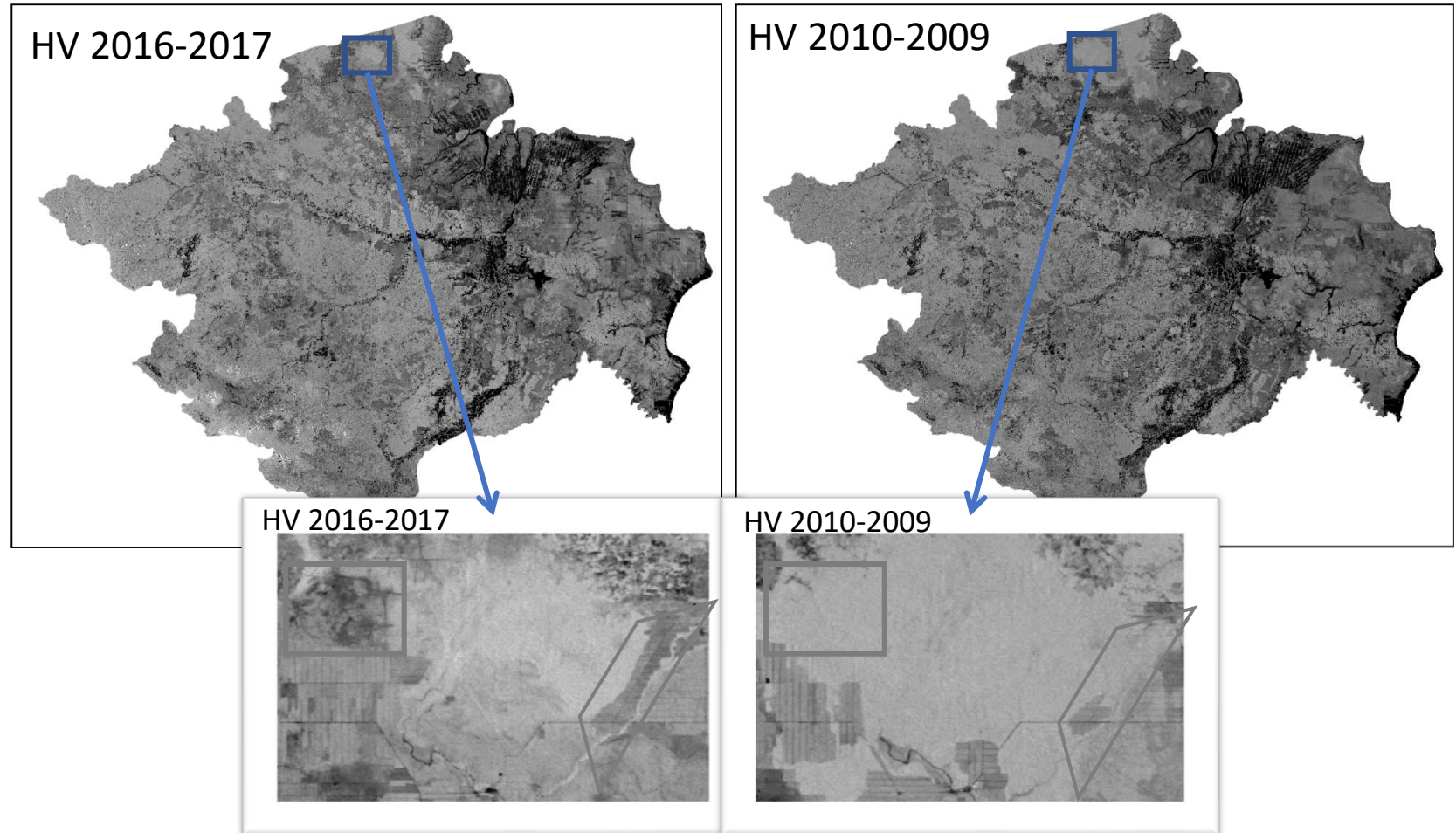
**Geographical scope/coverage**

**Environmental stewardship**

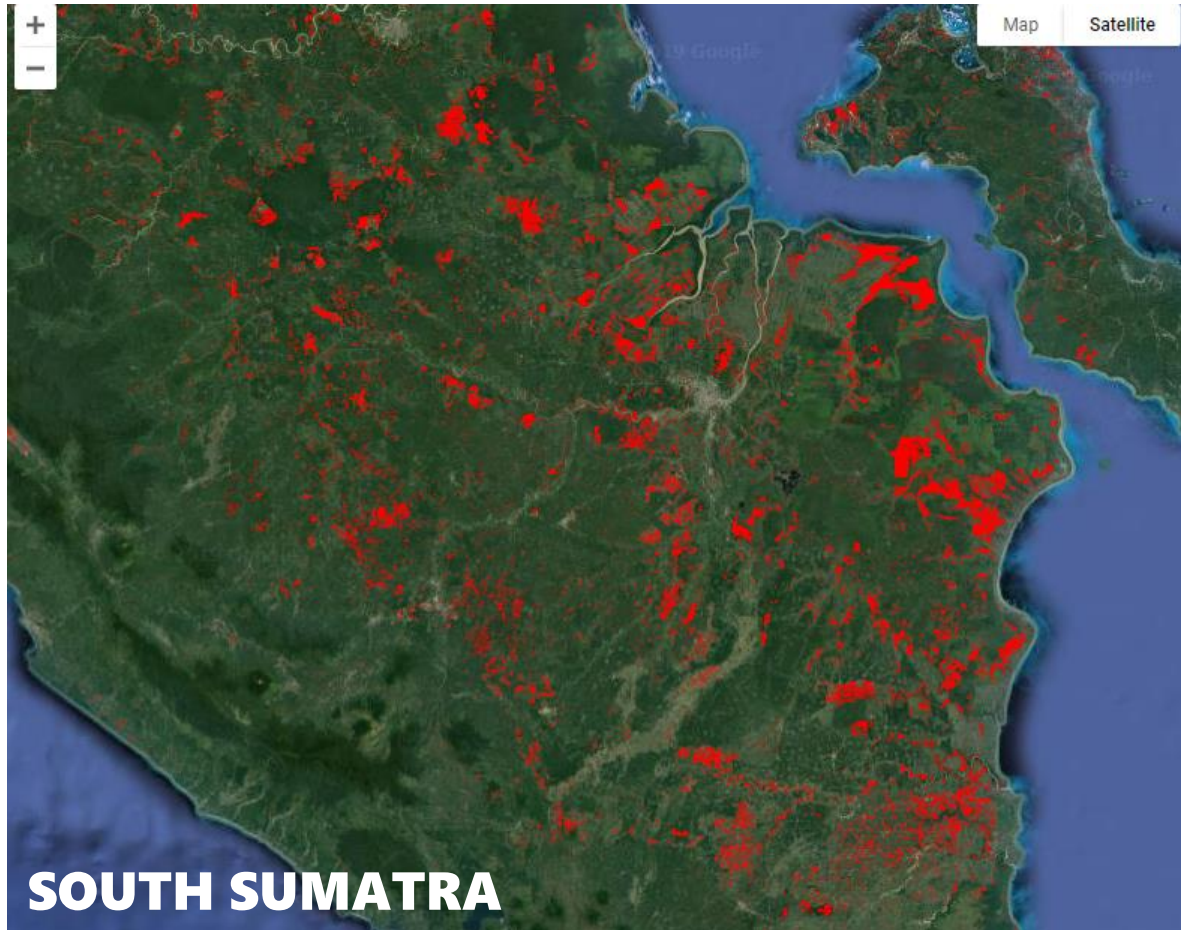


# Degradation Mapping: South Sumatra & East Kalimantan

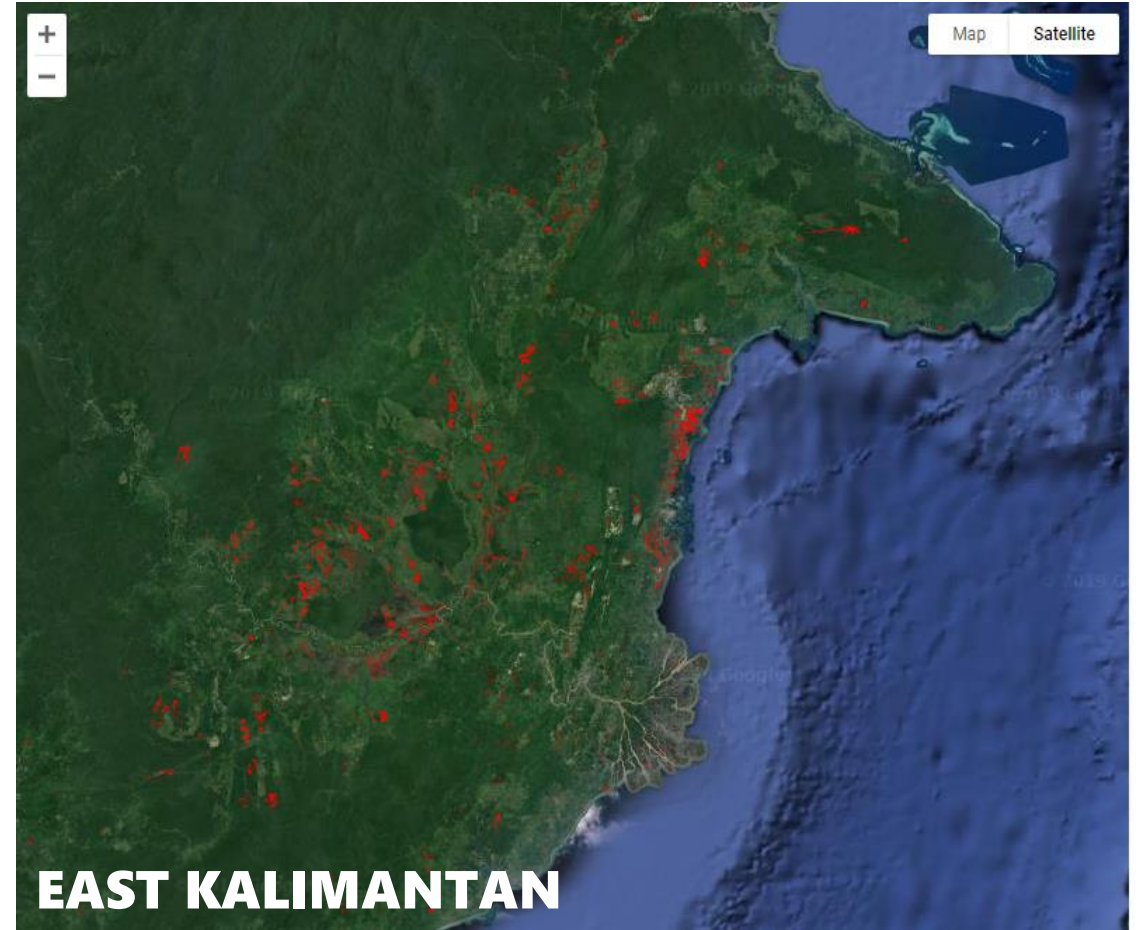
**Assess disturbances in the land cover and other biophysical disturbances using ALOS PALSAR imagery from 2010 to 2017 and Sentinel-1 imagery from 2015-2019.**



# Degradation Mapping: South Sumatra & East Kalimantan



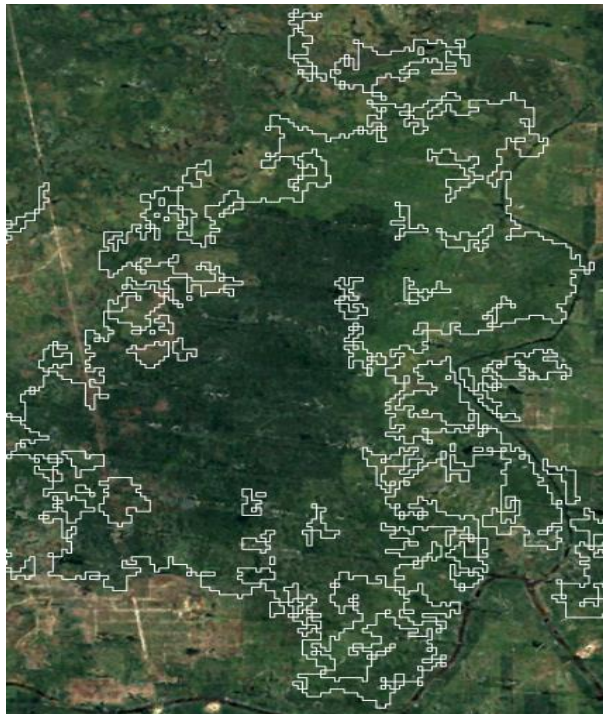
**2010 – 2015: 68,000 sites**  
**2015 – 2018: 43,000 sites**



**2010 – 2015: 47,000 sites**  
**2015 – 2018: 45,000 sites**

# Degradation Mapping: South Sumatra & East Kalimantan

**Primary and secondary forests affected by fires**



**2009**



**2012**



**2013**



**2016**

# Degradation Mapping: South Sumatra & East Kalimantan

Secondary forests cleared and burned for agriculture



**2009**



**2010**



**2011**



**2013**



**2016**

# What are the gaps?

**Different types of degradation**

**Variable biophysical conditions**

**Complex land histories**

...

# How can crowdsourcing help?

# Earth Observation + Crowdsourcing

1

## Land cover analysis

Crowd-driven classifications of high-resolution satellite imagery through rapid binary sorting



South Sumatra & East Kalimantan:  
**April-August & Sept-Nov**



National campaign:  
**Oct/Nov**

2

## In-situ validation

Field verification based on EO-based change detected with unknown causes of change



South Sumatra & East Kalimantan:  
**Nov/Dec**

3

## Restoration preferences

Survey of local, community-based preferences of restoration measures



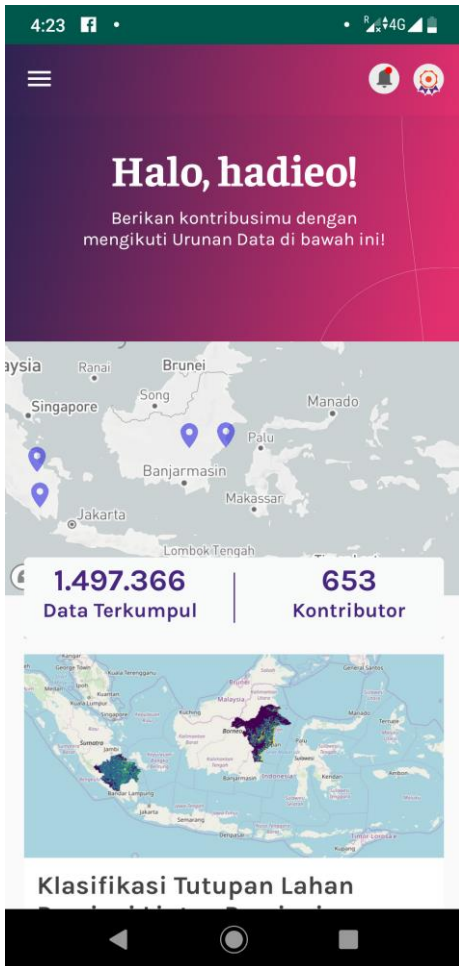
National campaign:  
**Q1 2020**



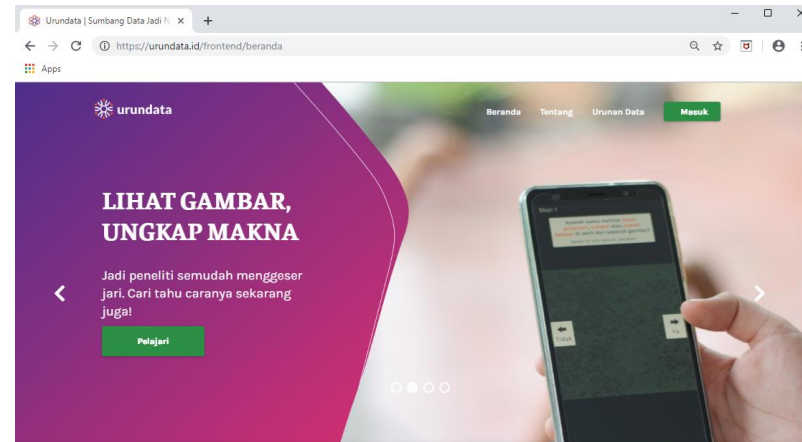
# Mobile and web-based platform



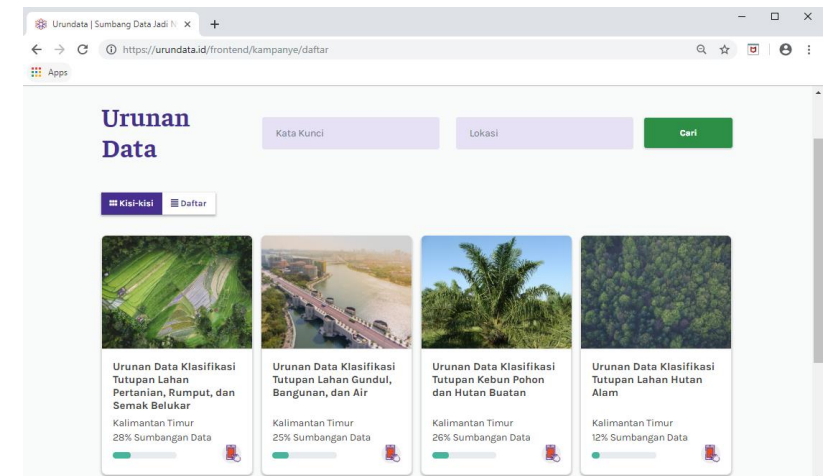
## Urundata Mobile Application



## Urundata Website



<https://urundata.id>



# 1 Land Cover Analysis

**Focus: Onboarding & Engagement**  
**Target Groups: Universities**

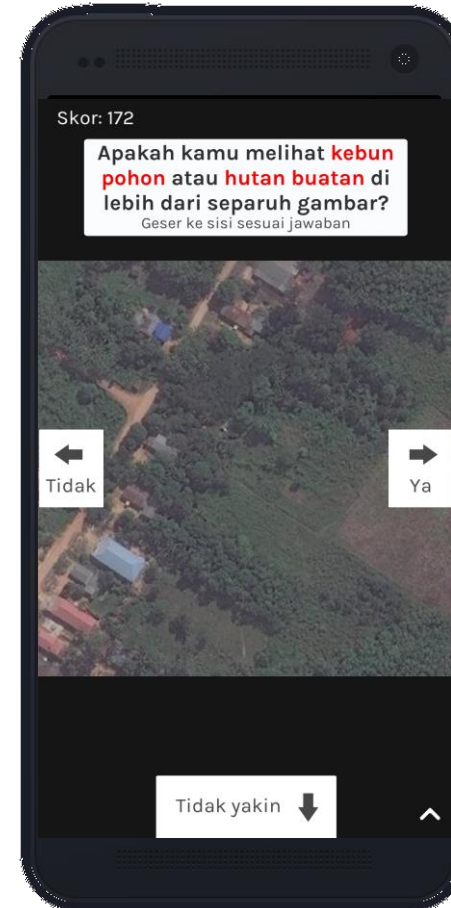
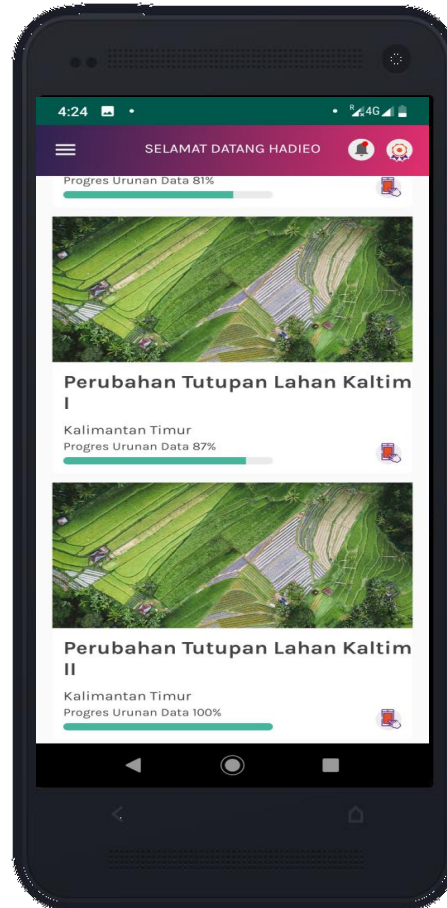
**Various piles of high-resolution imagery**

**Rapid assessment**

**Yes / No sorting**

**Expert inputs for QA**

**Leaderboards**



# 1 Land Cover Analysis

Focus: Onboarding & Engagement  
Target Groups: Universities



**14** Universities



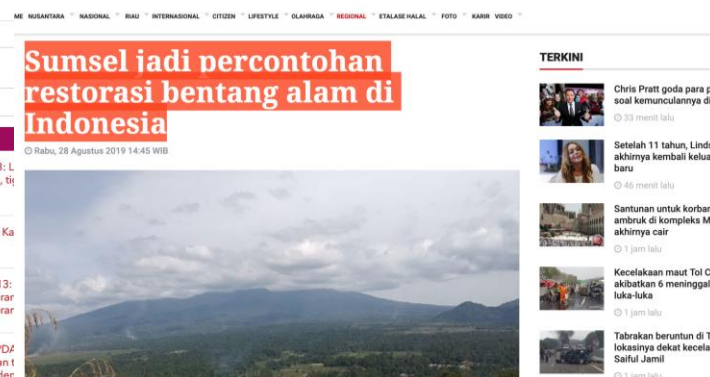
**1,123** subscribers  
**676** active users



**9** Local news outlets



**1.74 million**  
data contributions



# 2 Crowdsourcing in-situ validation



**Focus: On-site validation of target locations**

**Target Groups: University students, Researchers, Field officers, NGO workers**

**VEGETATION STRUCTURE**

**SPECIES COMPOSITION**

**DOMINANT VEGETATION HEIGHT**

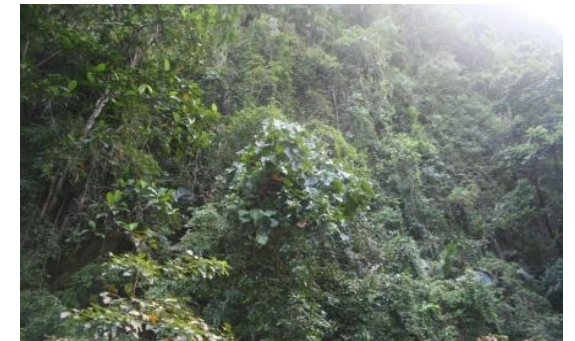
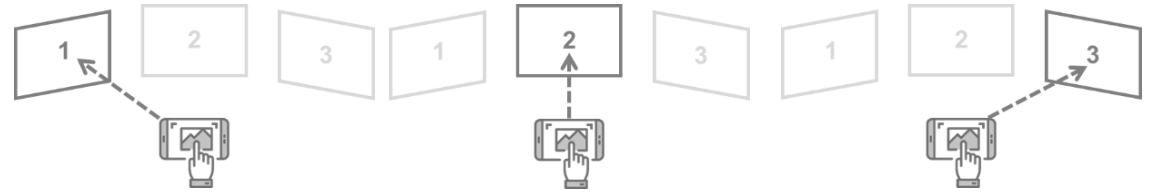
**FAUNA**

**EVIDENCE OF DEFORESTATION**

**ESTIMATED YEAR/DATE OF DEGRADATION**

**LAND COVER HISTORY**

**DEGRADED (YES/NO)**



# 3 Restoration Preferences



**Focus: Local & community-driven restoration potential**

**Target Groups: University students, Researchers, Field officers, NGO workers**

**LOCAL-LEVEL CONSULTATION WITH COMMUNITIES**

**ADDRESSING SPECIFIC DEGRADATION CHALLENGES**

**CHOOSING FROM SPECIFIC RESTORATION OPTIONS**

**LEVERAGING MOBILE TECHNOLOGY AND  
URUNDATA COMMUNITY**



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