Alert-driven Community-based Forest monitoring: A case of the Peruvian Amazon

Monitoreo y Participación Comunal

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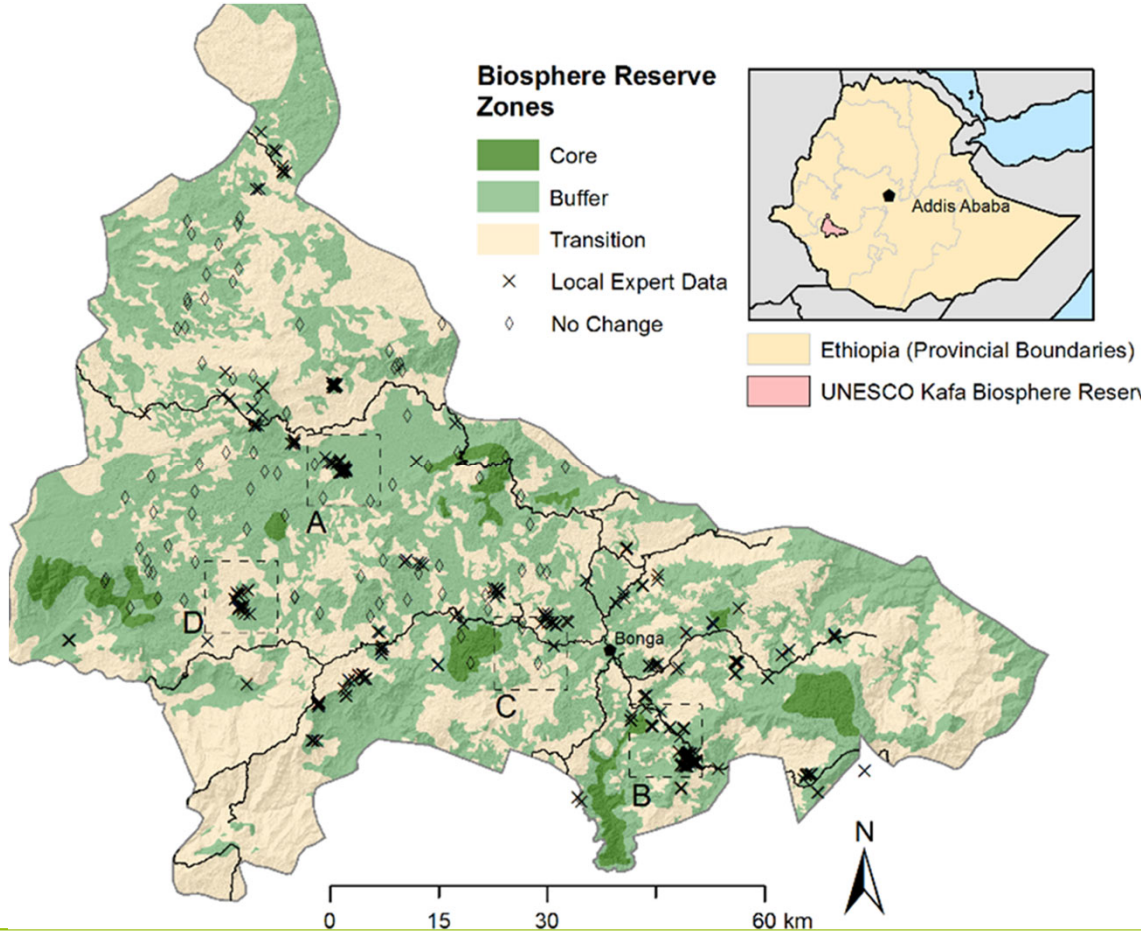
On behalf of
Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety
of the Federal Republic of Germany

Participatory Forest Monitoring Using Satellite Data and Mobile Phone Technology

- The concepts of participatory forest monitoring using satellite data and mobile phone technology have been developed and tested in the Kafa Biosphere Reserve in southwestern Ethiopia.

- https://en.nabu.de/topics/biodiversity/kafa-biodiversity/index.html



Peru context

- Peru the fifth country in the world with the highest percentage of primary forests (4%)
- Forest lost around 29,211.37 square kilometers(2001-2022)
- Ministry of the Environment established the National Program of Forest Conservation for the Mitigation of Climate Change (PNCMCC) in July 2010

Goal: Conserve the primary forest

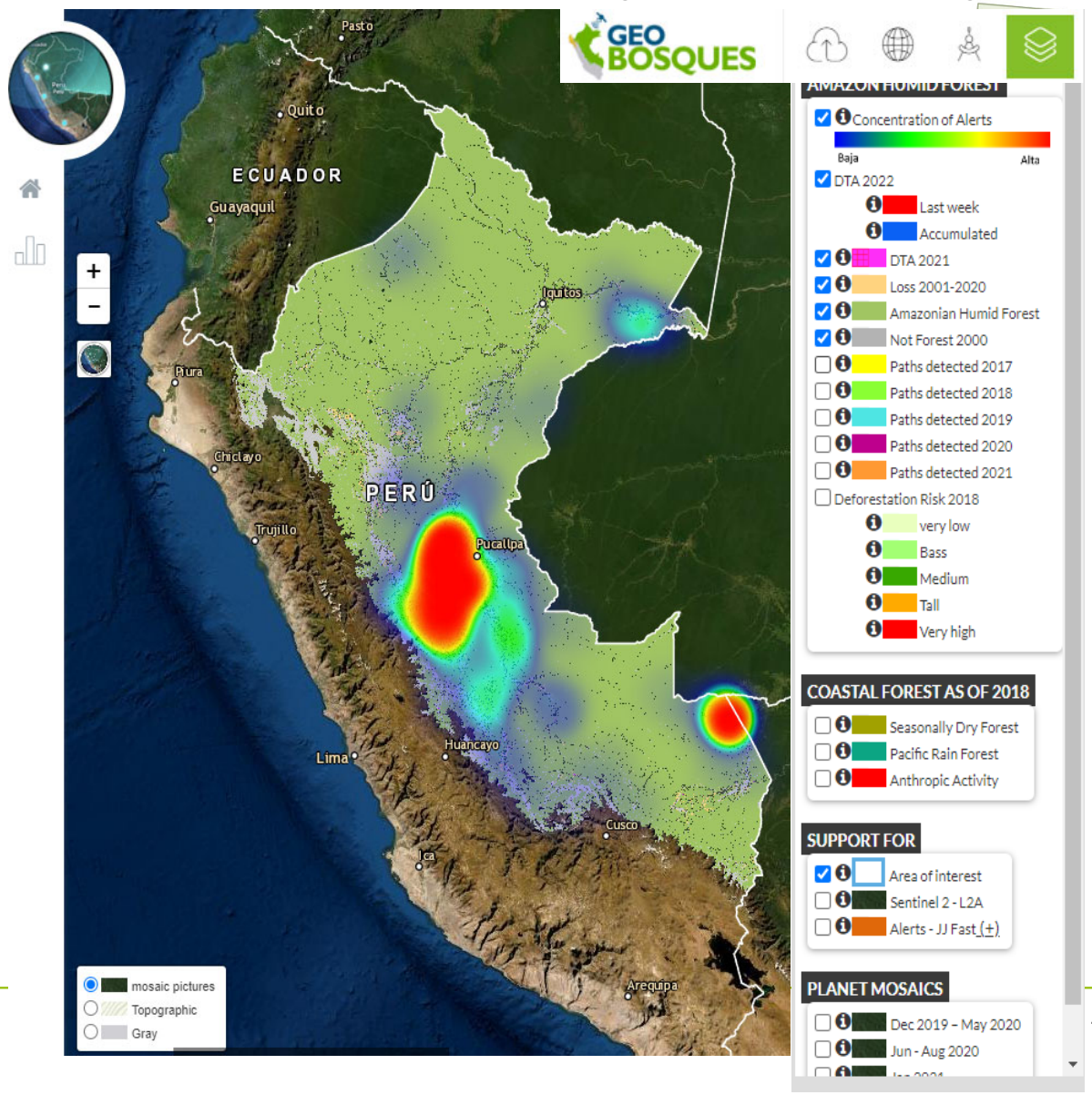
Key mechanism:

  - Satellite-based deforestation Alert system (geobosques)
  - An incentive program Conditional Direct Transfer (TDC) for community-based monitoring (CBM)

Peru deforestation Alert system

https://geobosques.minam.gob.pe/

- Operational satellite-based system for forest change alerts
- Alerts are derived from Landsat with a resolution of 30m
- Update frequency is every 16 days
- Alerts can be personalized based on area of interest and received by emails
- Forest loss mapping scale (0.09 Ha)



Community-based forest monitoring in Peru

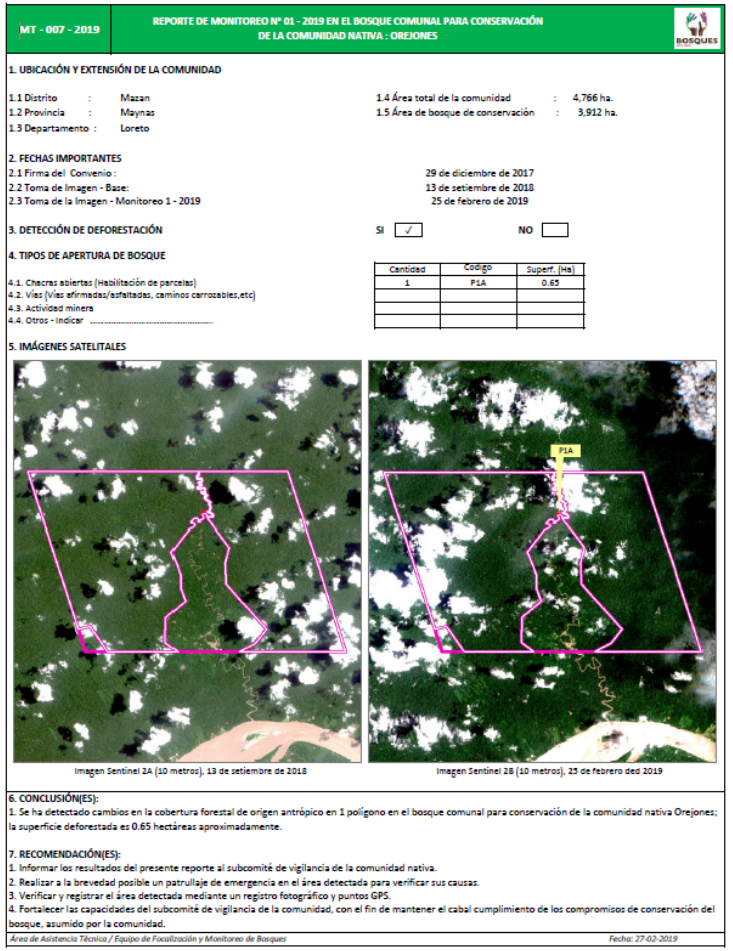
Aim: To engage indigenous communities to protect a portion of their territory

Approach:

- Community preserves forest (5 years agreement)
- Based on a signed agreement, communities receive 10 Peruvian soles per hectare (about 2.68 USD)
- Monitor and control their forests and territories
- Verify the satellite-based forest change alerts

Achievements: Last 10 years, 274 communities engaged, almost 3 million hectares of forest monitored

Goals: By 2030, Conserve 10 million hectares of forests through 1000 native communities



MT - 007 - 2019

REPORTE DE MONITOREO Nº 01 - 2019 EN EL BOSQUE COMUNAL PARA CONSERVACIÓN DE LA COMUNIDAD NATIVA : OREJONES

1. UBICACIÓN Y EXTENSIÓN DE LA COMUNIDAD

1.1 Distrito : Mazan
1.2 Provincia : Maynas
1.3 Departamento : Loreto
1.4 Área total de la comunidad : 4,766 ha.
1.5 Área de bosque de conservación : 3,912 ha.

2. FECHAS IMPORTANTES

2.1 Firma del Convenio : 29 de diciembre de 2017
2.2 Toma de Imagen - Base: 13 de setiembre de 2018
2.3 Toma de la Imagen - Monitoreo 1 - 2019 25 de febrero de 2019

3. DETECCIÓN DE DEFORESTACIÓN SI ✓ NO

4. TIPOS DE APERTURA DE BOSQUE

	Cantidad	Código	Superf. (Ha)
4.1. Chacras abiertas (Habilitación de parcelas)	1	P1A	0.65
4.2. Vías (Vías afirmadas/asfaltadas, caminos carrozables,etc)			
4.3. Actividad minera			
4.4. Otros - Indicar			

5. IMÁGENES SATELITALES

Imagen Sentinel 2A (10 metros), 13 de setiembre de 2018

Imagen Sentinel 2B (10 metros), 25 de febrero ded 2019

6. CONCLUSIÓN(ES):

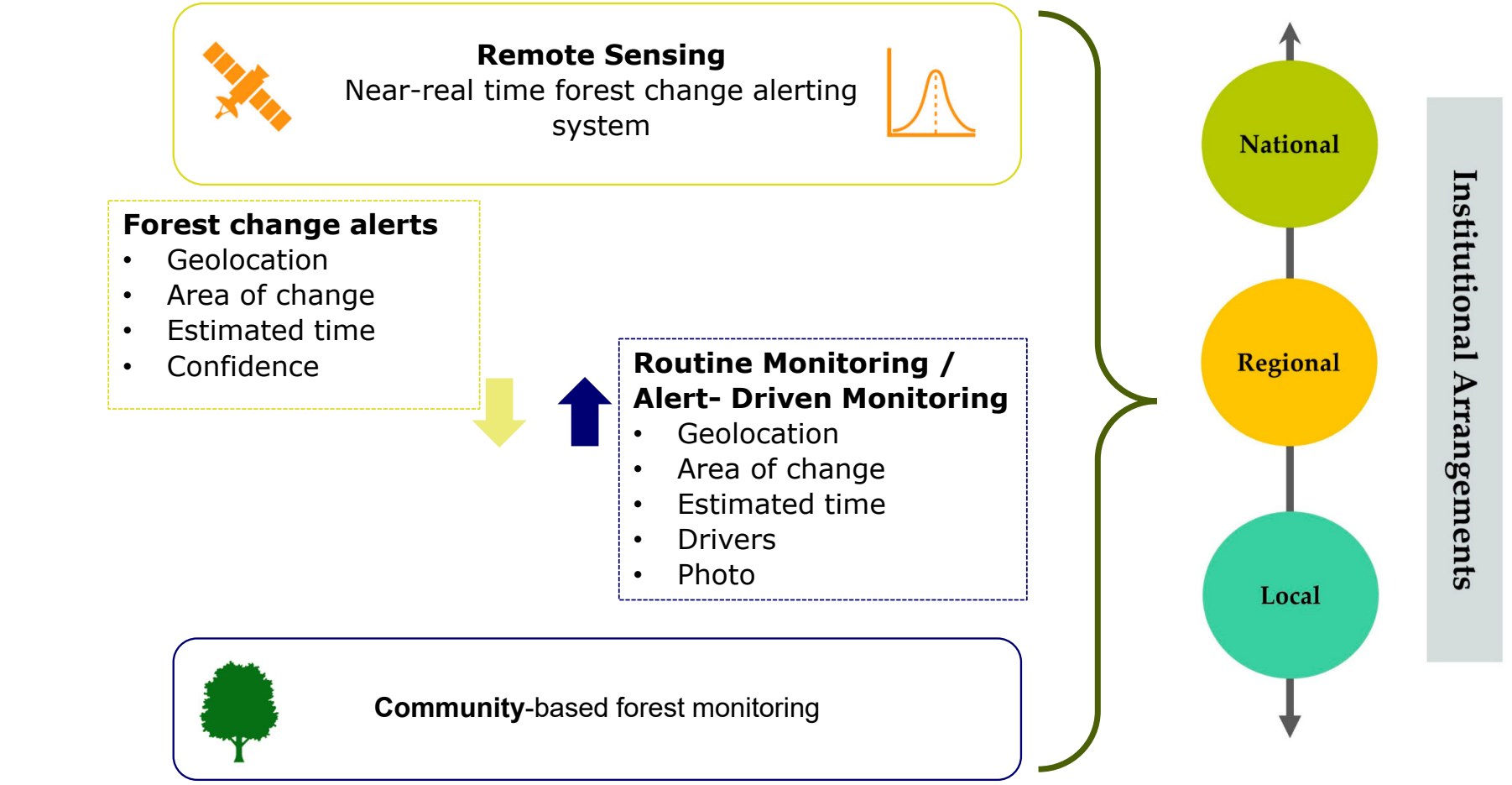
1. Se ha detectado cambios en la cobertura forestal de origen antrópico en 1 polígono en el bosque comunal para conservación de la comunidad nativa Orejones; la superficie deforestada es 0.65 hectáreas aproximadamente.

7. RECOMENDACIÓN(ES):

1. Informar los resultados del presente reporte al subcomité de vigilancia de la comunidad nativa.
2. Realizar a la brevedad posible un patrullaje de emergencia en el área detectada para verificar sus causas.
3. Verificar y registrar el área detectada mediante un registro fotográfico y puntos GPS.
4. Fortalecer las capacidades del subcomité de vigilancia de la comunidad, con el fin de mantener el cabal cumplimiento de los compromisos de conservación del bosque, asumido por la comunidad.

Área de Asistencia Técnica / Equipo de Focalización y Monitoreo de Bosques *Fecha: 27-02-2019*

Community-based Forest monitoring set-up



Objective

Main objective: To develop transparent community-based forest monitoring system by combining local knowledge and mobile technologies, to support national commitment for forest conservation and human well-being

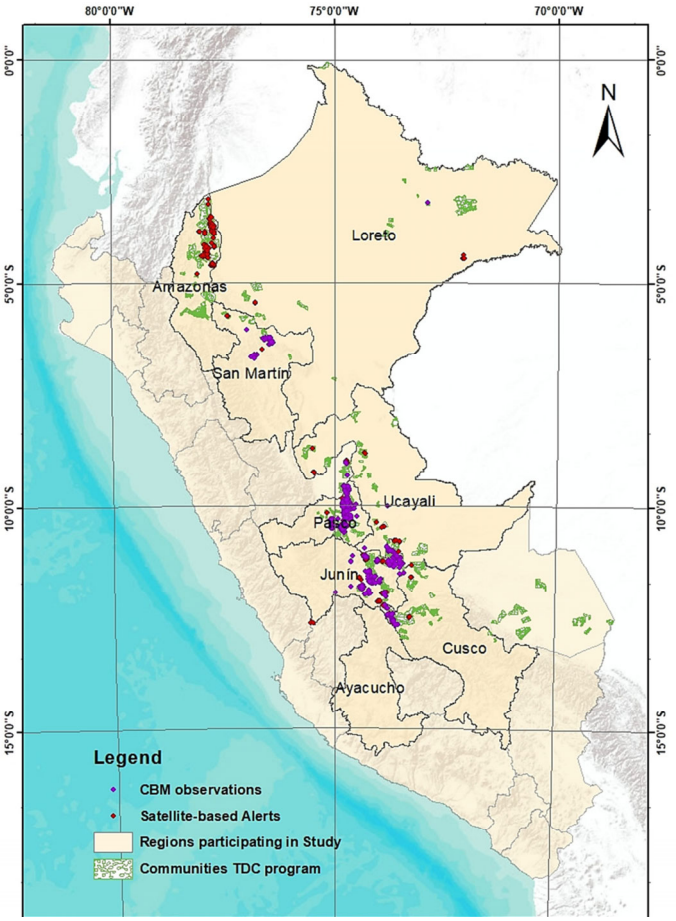
Subobjective:

- Assessment of the existing Alert-Driven Community-Based Forest Monitoring System (Data Perspective)
- Design and Implement transparent community-based forest monitoring system Using a Mobile App
- Illustrate system for trust, confidence-building and flexible implementation for larger areas

Assessment of the Existing Alert-Driven Community-Based Forest Monitoring System (Data Perspective)

Assessment of community-based forest monitoring data

- 1853 CBM data were collected by 45 different communities, over the six regions in Peru (2015 - 2019)
- Evaluate CBM data
  - Community participation
  - Data quality: thematic detail, spatial and temporal accuracy
  - Fitness for use in conjunction with satellite-based alerts

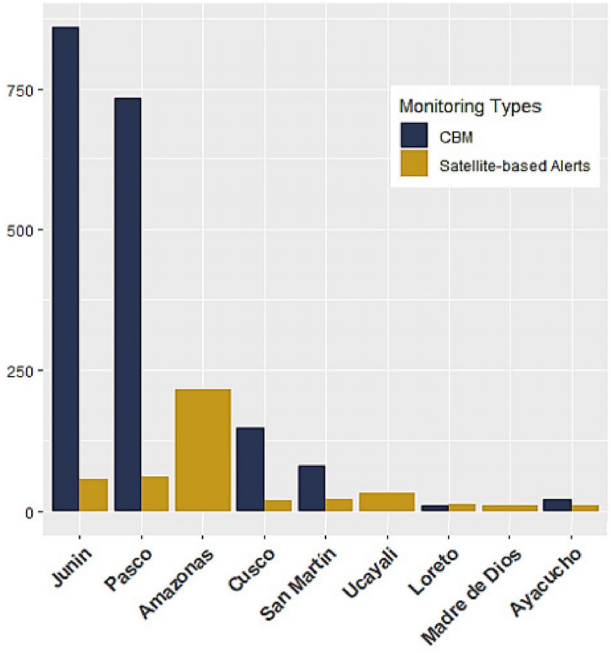


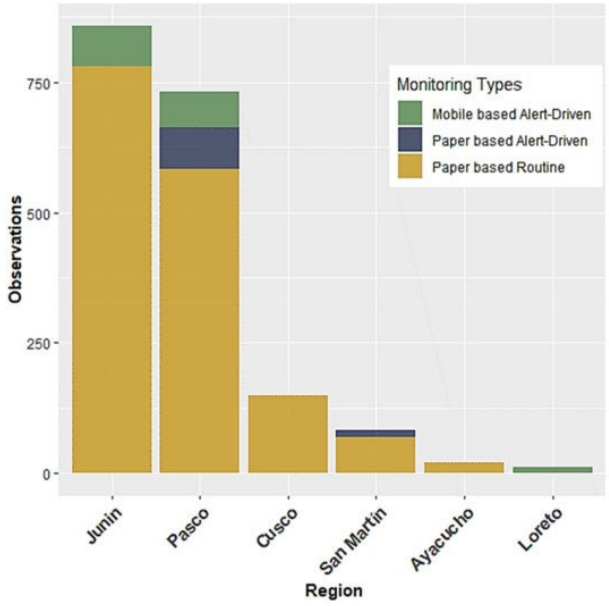
Cappello, C.; Pratihast, A.K.; Pérez Ojeda del Arco, A.; Reiche, J.; De Sy, V.; Herold, M.; Vivanco Vicencio, R.E.; Castillo Soto, D. Alert-Driven Community-Based Forest Monitoring: A Case of the Peruvian Amazon. *Remote Sens.* **2022**, *14*, 4284.

Monitoring types and categories

Routine monitoring (95%): periodic monitoring carried out at least 4 times a year by trained “vigilance committees”

Alert-driven monitoring (5%): additional monitoring in response to early warnings from the Government or alerts from the communities.





Summary of the Assessment

Lack of consistency and completeness of information

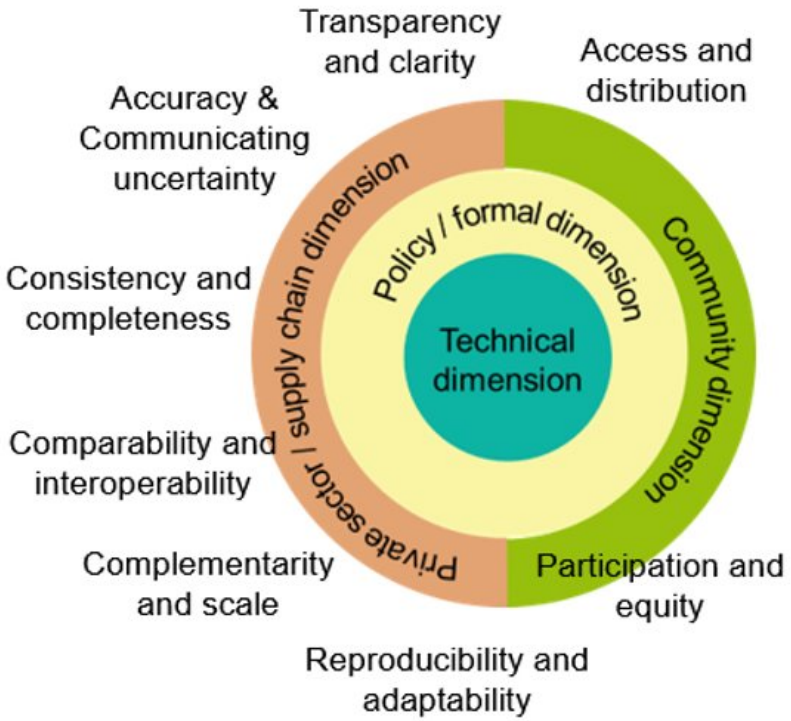
- Large amount of work involved in transcribing/ digitizing the data
- Typing errors
- Difficult to link data and photographs

Delay in transferring satellite-based alerts to community

Limited understanding on how to use/integrate/compare CBM data

Design and Implement transparent community-based forest monitoring system using a Mobile App

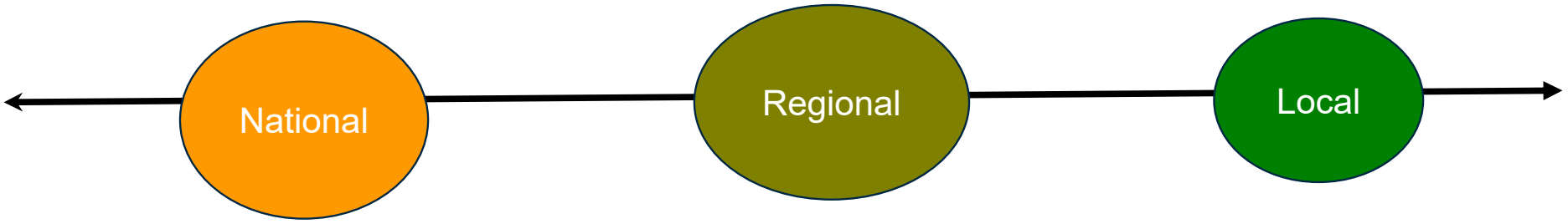
Transparent Monitoring: From Idea to Reality



Country	Peru
Related elements	Element 2: Accuracy and uncertainty Element 5: Complementarity and scale Element 7: Access and distribution Element 8: Participation and equity Element 9: Responsibility & accountability
Related dimensions	Policy dimension Community dimension

Transparent Monitoring: From Idea to Reality

- A series of workshop to co-design the monitoring system



Transparent Monitoring: From Idea to Reality

- We created a mobile data collection system for Routine Monitoring / Alert-Driven Monitoring.
- We created an assessment framework to better understand the quality, quantity, transparency, and utility of CBM data.
- We also created training manuals, Capacity building workshops and a feedback mechanism.

Mobile data collection system

Code:	DEFORESTATION ALERT VERIFICATION FORM

REPORTED BY:

Names and surnames	Position	Phone	Signature and ID
1			
2			
3			
4			
5			

Community: Department: Dates

DETAIL OF THE DEFORESTATION EVENT

CODES FOR REPORTING INFORMATION

Code	Activity	Code	Agent	Code	Purpose
A	Agriculture	1	Resident of the community itself	I.	Food
B	Cattle raising	2	Resident of another community	II.	Increase in economic income
C	Forest extraction	3	Settler (no indigenous)	III.	Household
D	Mining	4	Project	IV.	Education
E	Transport	5	Private company	V.	Road infrastructure
F	Human occupation	6	Populations in voluntary isolation	VI.	Boundary problems (invasion / colonization)
G	Others (Energy, Tourism, etc)	7	Natural phenomena	VII.	Others (specify)
		8	Others (specify)		

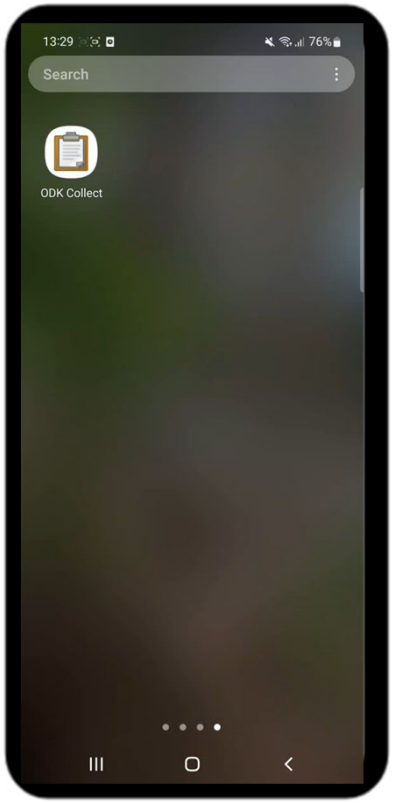
* If you have received an alert report and must respond, put in the first column the code of the deforestation alert that you have verified and the activity, agent and purpose codes listed above, as applicable. Any additional details must be mentioned in the Description column.

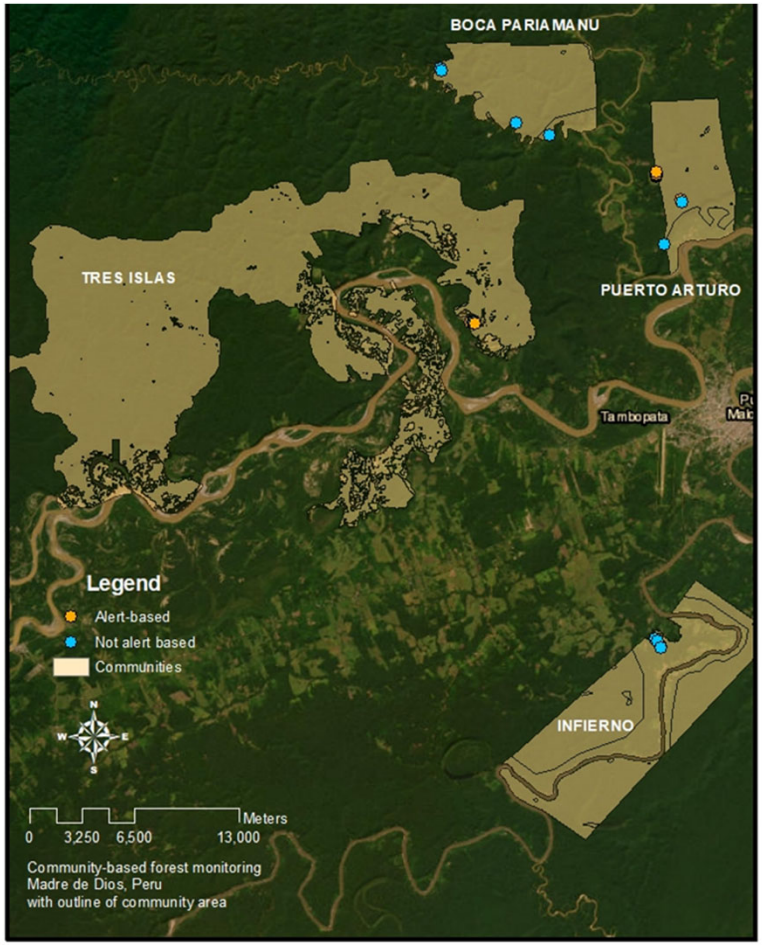
Deforestation alert code	Coordinates E	Coordinates N	Activity code	Agent code	Purpose code	Description (type of crop and / or stage, forest species, etc)
Ejem: P1A	729732	9645674.6	D	3	II	Artisanal mining

PHOTOGRAPHIC REGISTER

Alert code: Alert code:

PHOTOGRAPHY PHOTOGRAPHY





Summary of CBM data

Start date	End date	Total number	Alert verification
30-07-2022	21-04-2024	78	39

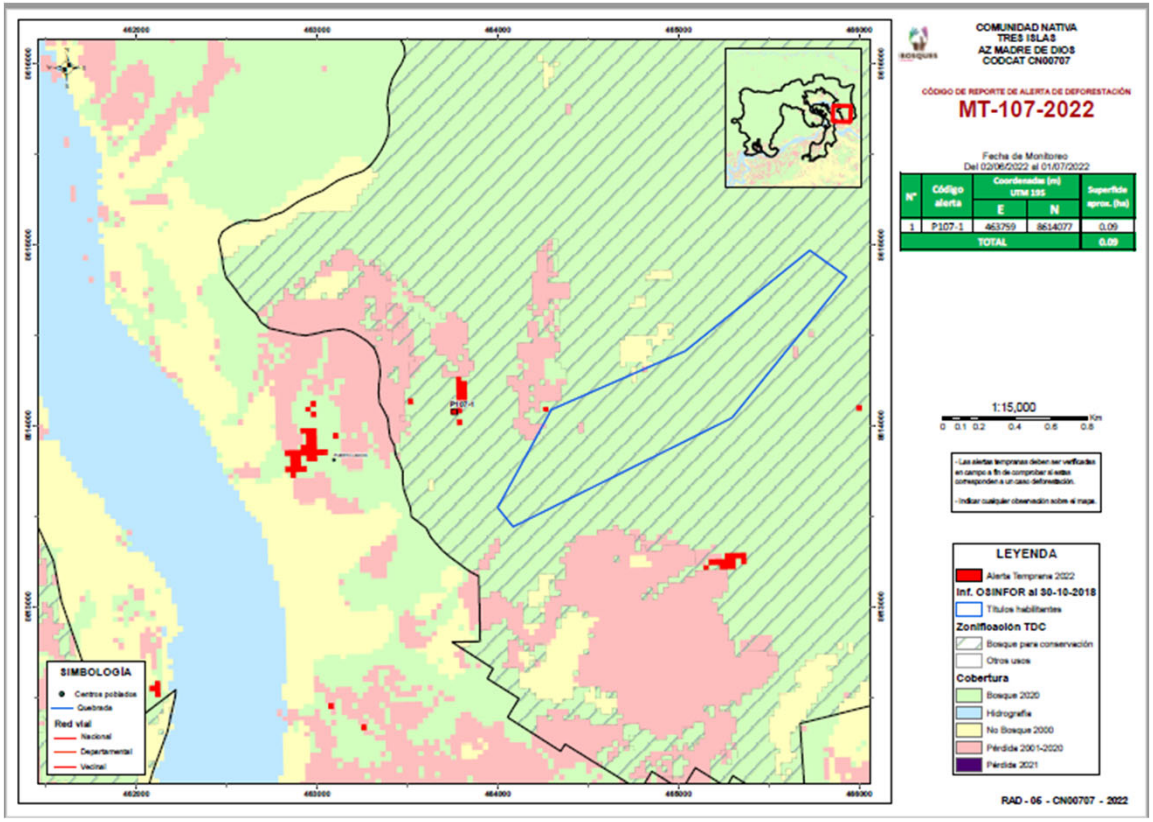
Alerts promptly addressed by the local community

Additional observations:

- Digital data
- Very few typing errors
- Easy to link data and photographs
- Good spatial quality

CODCAT	Nombre de la comunidad	Área Zonal	Año elaboración RAD	Código de RAD (reporte de alerta de deforestación)
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2022	MT-019-2022
CN00143	PUERTO ARTURO	SZ MADRE DE DIOS	2022	MT-020-2022
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2022	MT-063-2022
CN00143	PUERTO ARTURO	SZ MADRE DE DIOS	2022	MT-064-2022
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2022	MT-070-2022
CN00143	PUERTO ARTURO	SZ MADRE DE DIOS	2022	MT-071-2022
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2022	MT-080-2022
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2022	MT-107-2022
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2022	MT-176-2022
CN00143	PUERTO ARTURO	SZ MADRE DE DIOS	2022	MT-177-2022
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2022	MT-220-2022
CN00143	PUERTO ARTURO	SZ MADRE DE DIOS	2023	MT-027-2023
CN00707	TRES ISLAS	SZ MADRE DE DIOS	2023	MT-029-2023
CN00143	PUERTO ARTURO	AZ MADRE DE DIOS	2023	MT-027-2023
CN00707	TRES ISLAS	AZ MADRE DE DIOS	2023	MT-029-2023
CN00707	TRES ISLAS	AZ MADRE DE DIOS	2023	MT-110-2023
CN00707	TRES ISLAS	AZ MADRE DE DIOS	2023	MT-123-2023
CN00707	TRES ISLAS	AZ MADRE DE DIOS	2023	MT-145-2023
CN00143	PUERTO ARTURO	AZ MADRE DE DIOS	2023	MT-186-2023
CN00707	TRES ISLAS	AZ MADRE DE DIOS	2023	MT-244-2023
CN00707	TRES ISLAS	AZ MADRE DE DIOS	2023	MT-310-2023
CN00707	TRES ISLAS	AZ MADRE DE DIOS	2023	MT-375-2023

Example alert sent to communities



MT-107-2022

deviceid	collect:AAIhaYqDvE5CAETI
intro:intronote	
intro:welcomenote	
photo_report	View
code_report	MT-107-2022
name1	Luis wilfredo payaba trigoso
position1	Monitor
phone1	974672585
id1	71983147
name2	Jose Luis Huaypuna chao
position2	Monitor
phone2	953707552
id2	45779338
name3	Alexander condori figueroa
position3	Gestor
phone3	940230707
id3	76649643
name4	Ulmer villar vargas
position4	Monitor
phone4	916107395
id4	44302624
community	tres_Islas
community_other	
area_zonal	area_zonal_name
area_zonal_other	
region	madrededios
region_other	
dates:	2022-10-09
forest_identification:defor_alert_code	P107-1
forest_identification:forest_change	no
forest_identification:natural_loss	
forest_identification:natural_loss_other	
geopoint_widget_maps:Latitude	-12.5367113000
geopoint_widget_maps:Longitude	-69.3333222000
geopoint_widget_maps:Altitude	214.1000000000
geopoint_widget_maps:Accuracy	3.0000000000

Thematic Detail of data

FORMATO DE VERIFICACIÓN DE ALERTA DE DEFORESTACIÓN			Codigo:
Comunidad:	Area Zonal:	Departamento:	Fecha:

REPORTADO POR:				
Nombres y Apellidos	Cargo	Teléfono	DNI	Firma
1				
2				
3				
4				
5				

ORIGEN DE LAS ALERTAS

DEFORESTACION

Código	Actividad
A	Agricultura para autoconsumo
B	Agricultura para venta
C	Ganadería
D	Extracción forestal
E	Psicigranja
F	Pesca
G	Caminos / carreteras
H	Poblados / casas / locales
I	Electricidad
J	Mineria
K	Hidrocarburos
L	Turismo
M	Otros

Código	¿Quién realizó la actividad?
1	Poblador de la propia comunidad
2	Poblador de otra comunidad
3	Colono
4	Proyecto
5	Empresa privada
6	Poblaciones en aislamiento voluntario
7	Otros (especificar)

PÉRDIDA NATURAL

Código	Fenomeno natural
X	Deslizamiento, derrumbe
Y	Erosion fluvial / rio
Z	Viento

Coloque en la primera columna el código de la Alerta que ha verificado y los códigos arriba señalados, según corresponda. Cualquier detalle adicional debe ser mencionado en la coluna Descripción.

Código de alerta	Coordenadas		Código de Actividad	Código de Quién realiza la actividad	Descripción (tipo de cultivo y/o estadio, especies forestal, etc)
	E	N			
Ejem: P1A	729732	9645674	B	3	Mineria artesanal

OBSERVACIONES O COMENTARIOS
(Cualquier sugerencia, comentario o mayor detalle de la verificacion en campo)

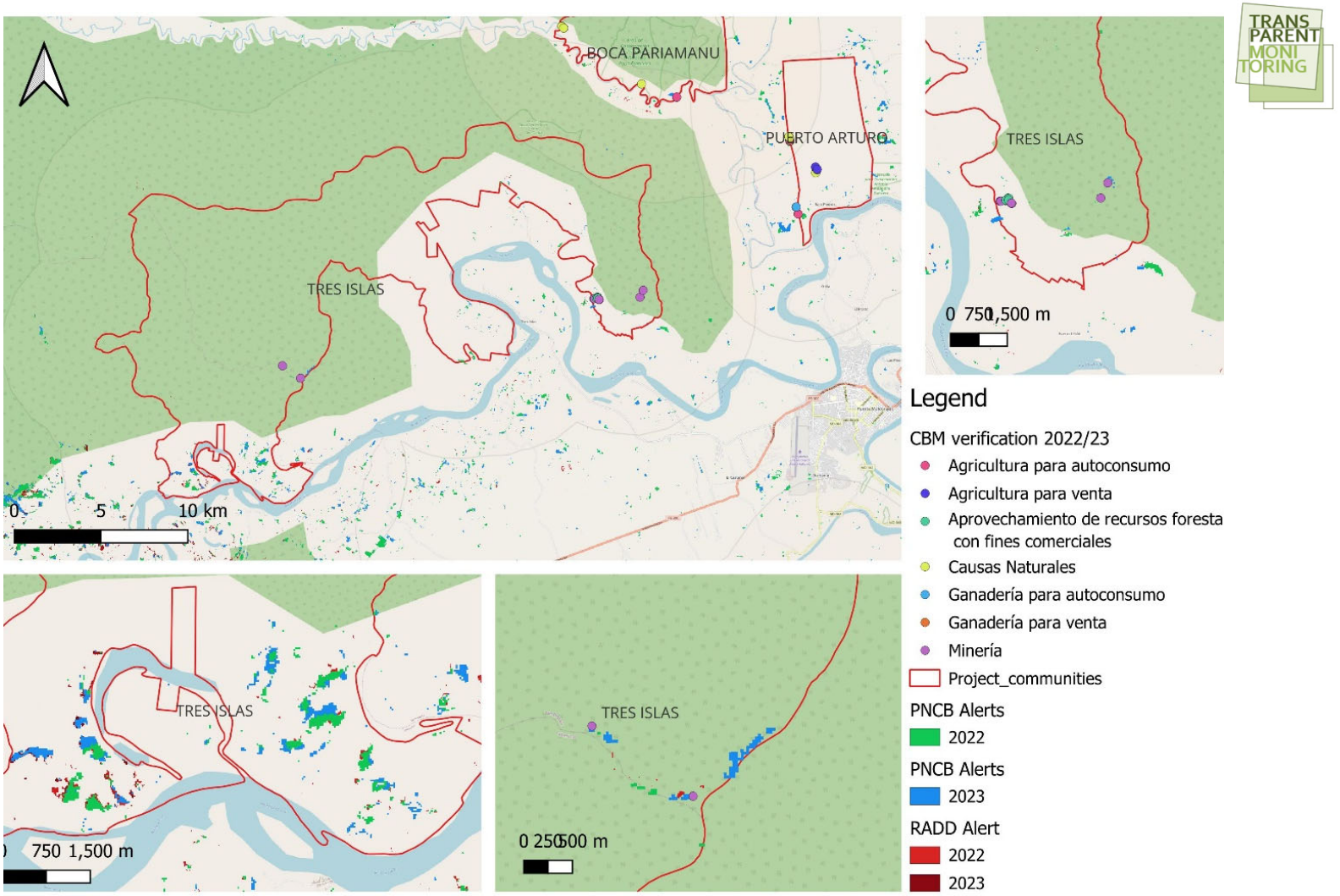
Tres Islas

Alerts mostly in the southern parts

Close to rivers

Mining frontier

Verification mainly mining

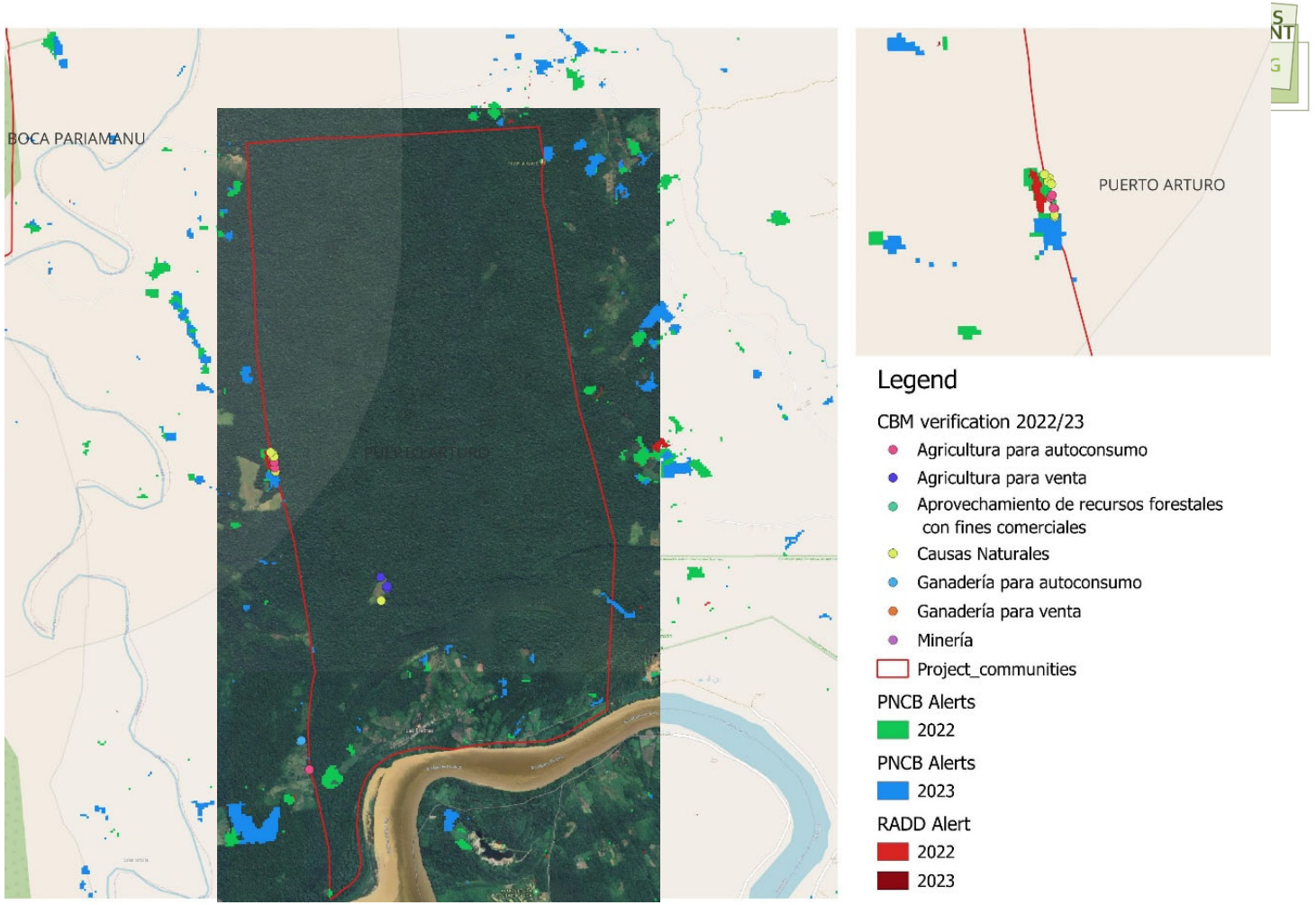


Puerto Arturo

Few Alerts

Dense forest cover within community territory

Verification mostly deforestation due to natural causes or Agriculture for self-consumption



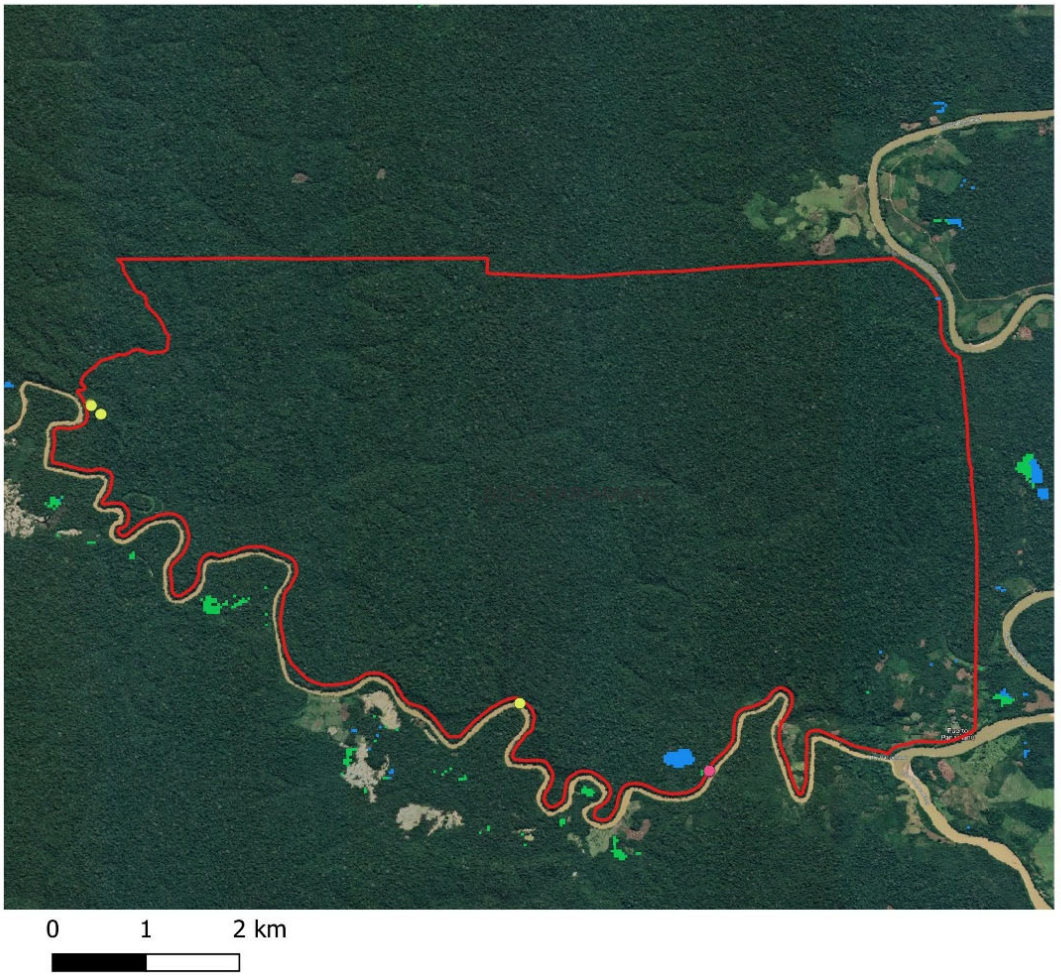
Boca Pariamanu

Very few Alerts

Very dense forest cover on community land

Def. manly natural causes or self-consumption

South of river outside comm. Lands, mining activities



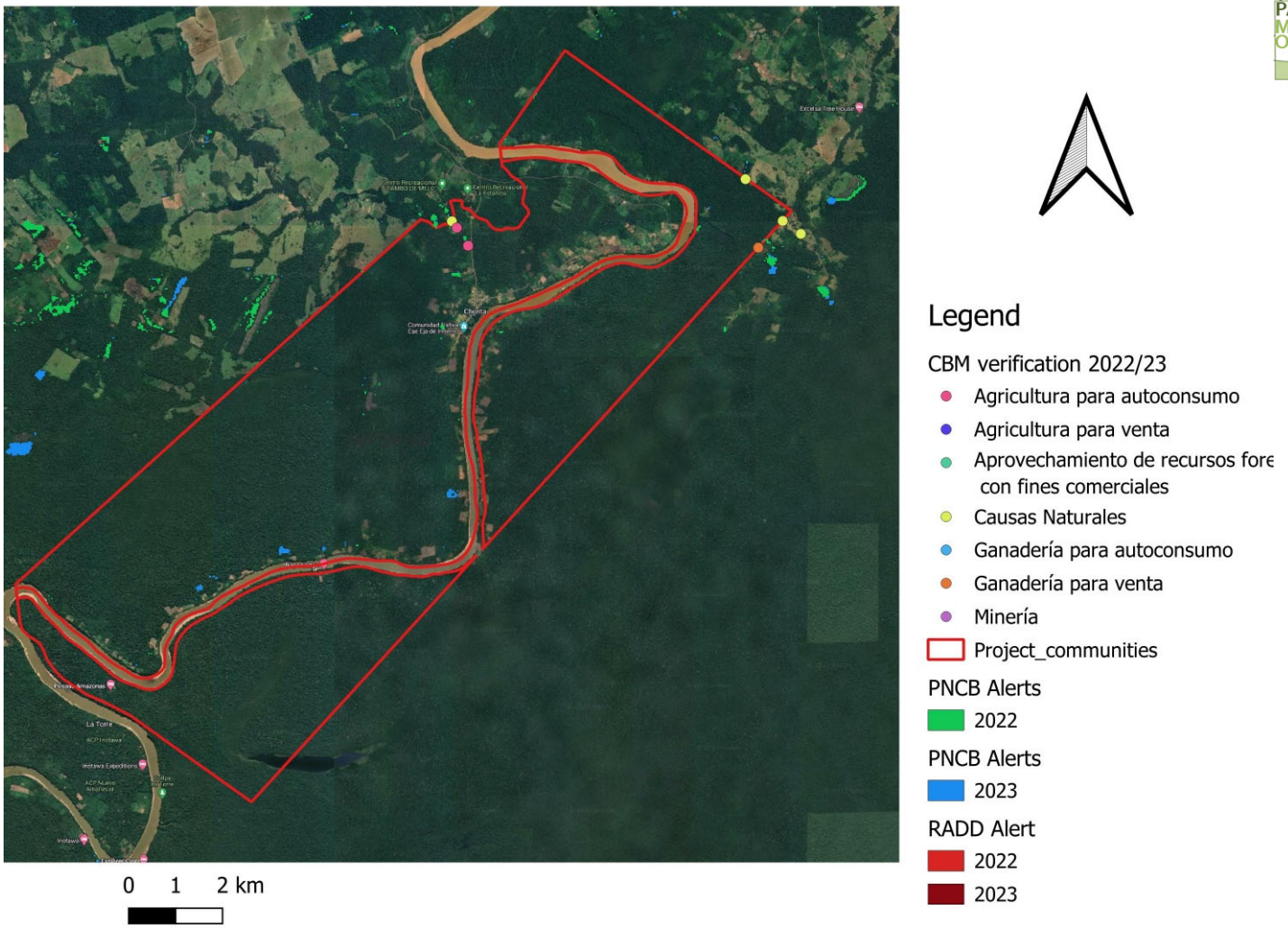
Infierno

Most accesible community from Puerto Maldonado

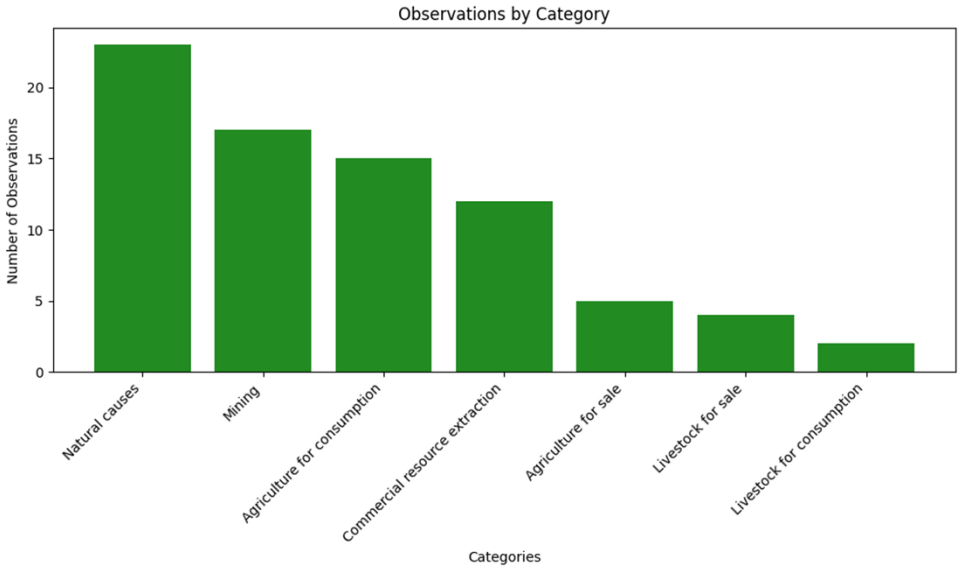
Few alerts in 2022 and 2023

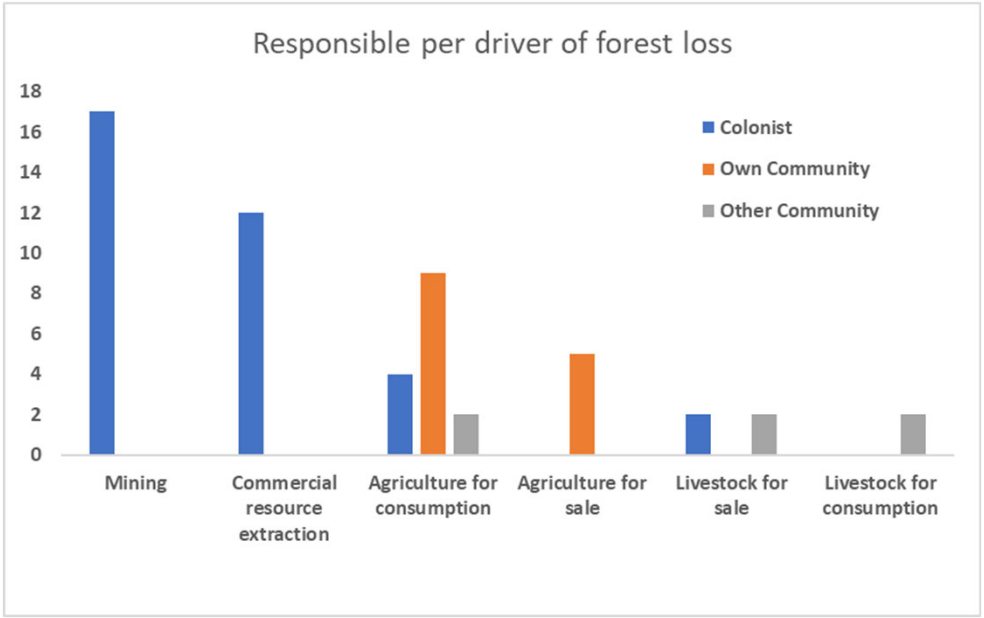
Most alerts along river

Agriculture for sale and self- connsumption and natural causes

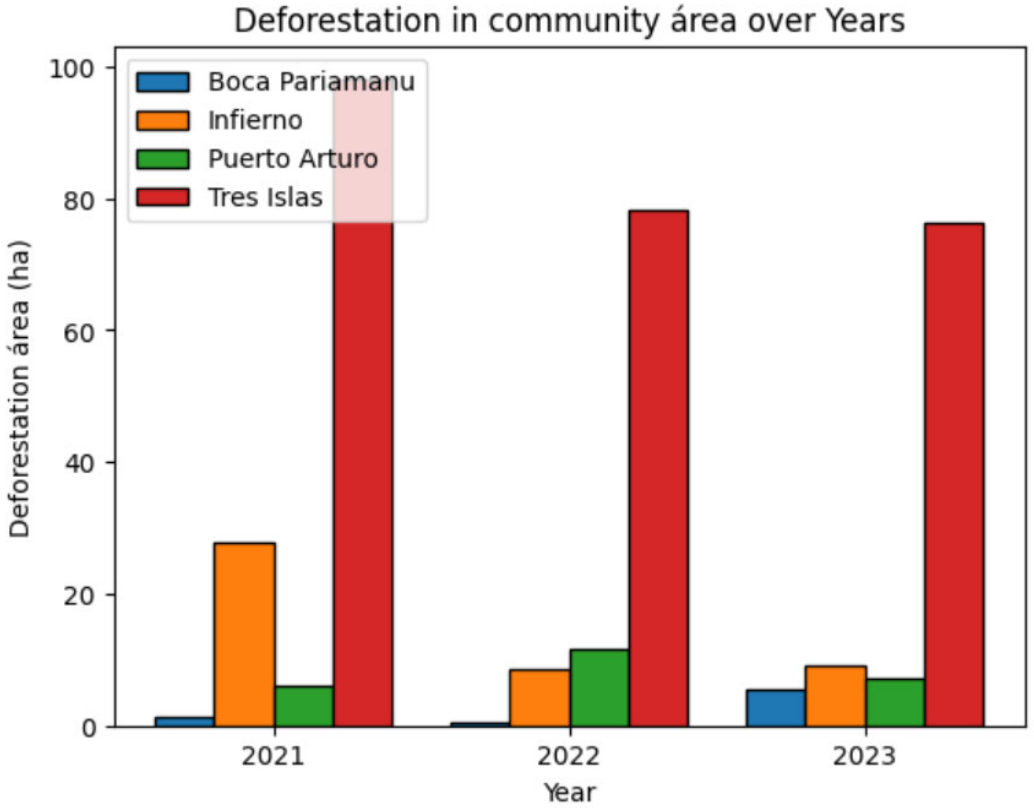


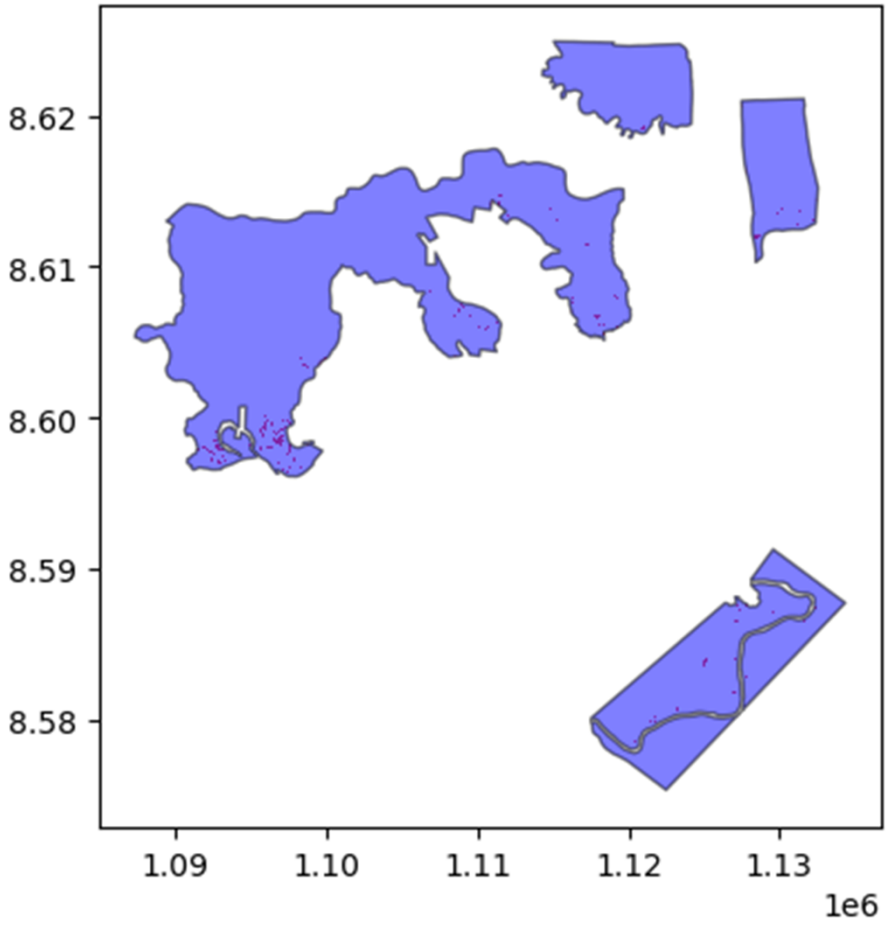
Drivers of deforestation identified by forest patrol



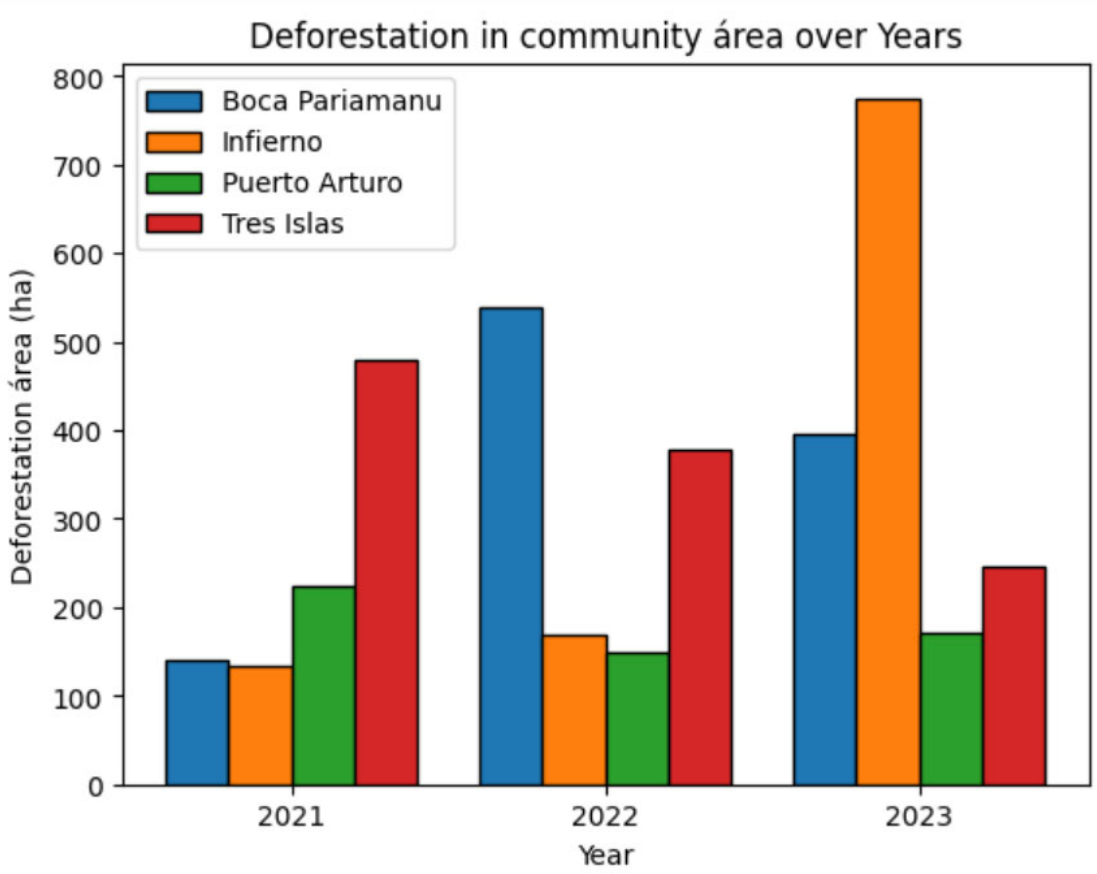


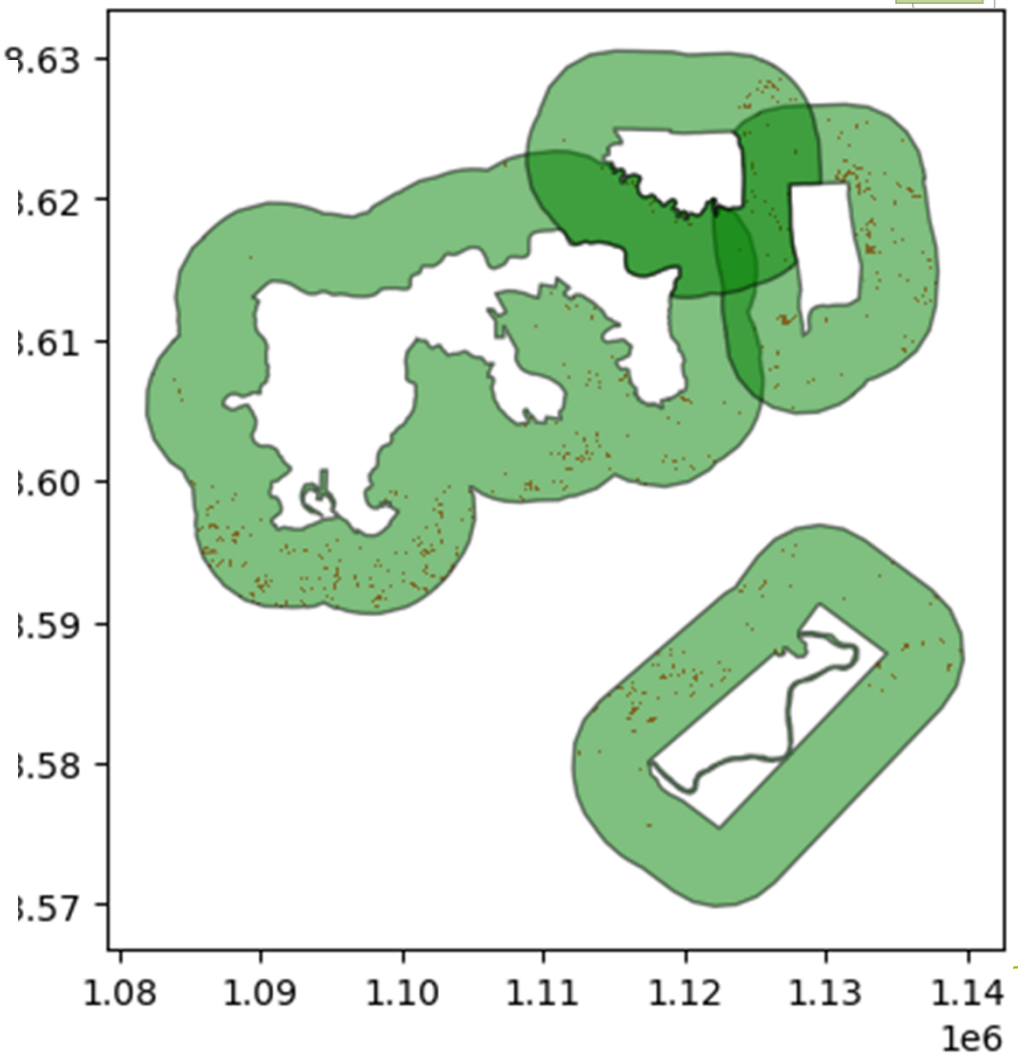
Deforestation in community area (ha) per year





Deforestation in Leakage área around communities in ha

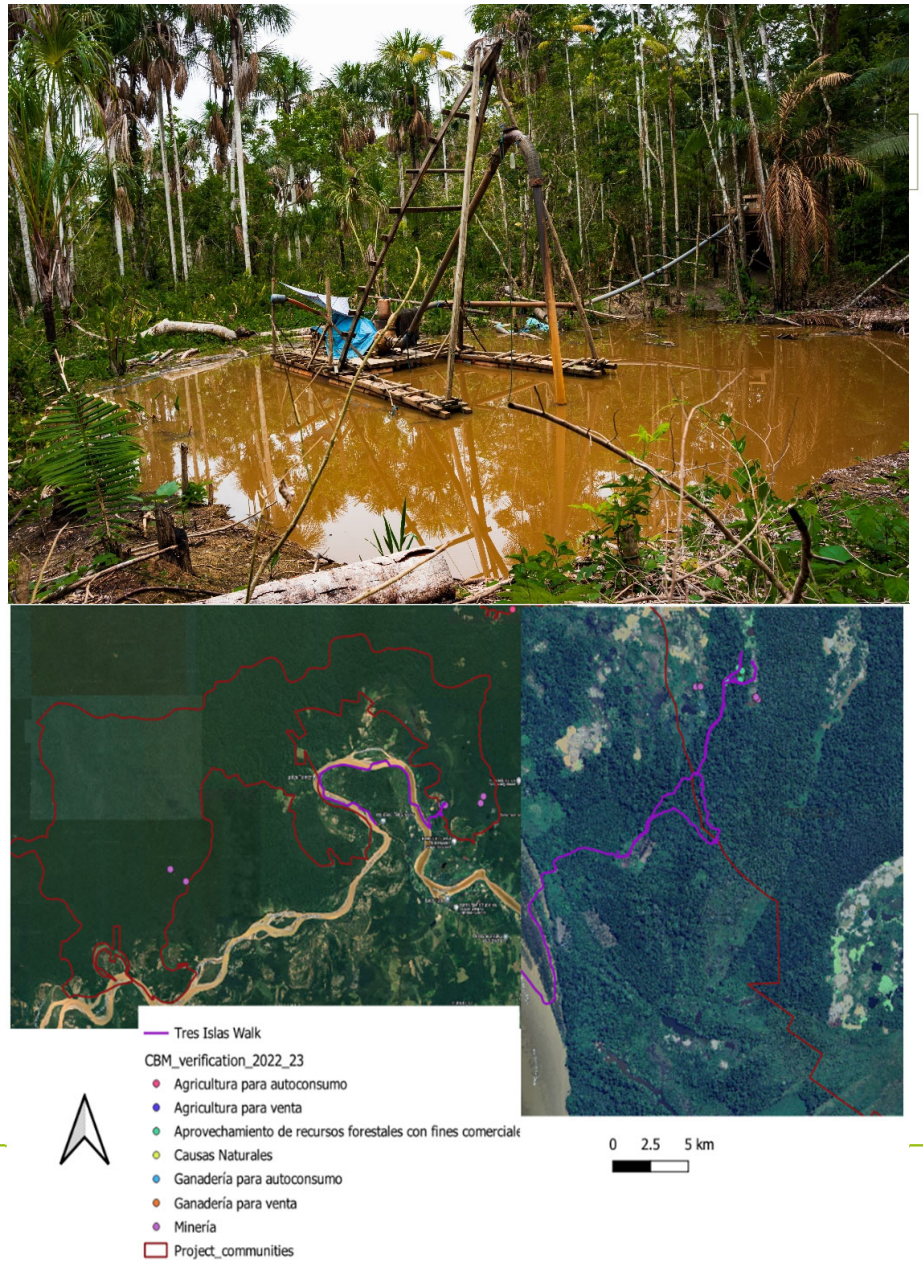




Illustrate system for trust, confidence-building and flexible implementation for larger areas

Community level

- Series of workshops and capacity-building programs
- Field trips involving community engagement (monitoring the appropriation of the tool)
- Feedback sessions on collected data and results
- Redesign ODK forms and manuals tailored for communities



Workshop Puerto Maldonado

December 2023

- Visit to communities to verify deforestation
- Gather data and feedback on mobile data collection
- Help design improved collection app
- Receive feedback from communities on app use

National level

- Presentation of technology used in CBM
- Experiences shared on implementation of Apps
- Brainstorming and drafting of Bosques App layout for broader application
- Workshop with developers and Project lead from PNCB/MINAM

Observations

- **Technology Adoption and Performance:**
  - Communities showed varying proficiency in smartphone and ODK use for monitoring.
  - Infierno and Tres Islas communities demonstrated superior surveillance capabilities.
- **Internet Access Challenges:**
  - Varying internet access affected real-time data transmission.
- **Gender Inclusivity:**
  - Three out of four communities actively involved women in monitoring.
- **Community Realities and Adaptations:**
  - Tres Islas faced monitoring challenges but complied with alerts.
  - Boca Pariamanu remained alert-free despite mining threats.
  - Puerto Arturo encountered and addressed alerts.
- **Community Agreement Status and Expectations:**
  - Tres Islas continues monitoring activities.
  - Boca Pariamanu and Puerto Arturo agreements finished in 2023.
  - Infierno agreement terminated due to exceeding deforestation limits.

Conclusions & Outlook

- Peru's alert-driven community-based monitoring program is unique
- Satellite-based alerts helps to locate deforested areas for targeted monitoring
- CBM data is rich in providing the process and drivers of forest change and has great potential for future forest conservation program development and implementation
- Moving from paper-based to mobile-based monitoring, to avoid ambiguity and time-lag in data collection
- Trainings and incentivization of the participating communities could further improve transparent forest monitoring and bridge the gap between alert-driven CBM systems.

Thank you for your attention!

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Wageningen, Netherlands

Story maps Community-base Forest Monitoring in Peru