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CLIMATE ACTIONS AND JUST TRANSITION: FIRST INTERNATIONAL CONFERENCE

Critical remote sensing in practice: community drones, engaged ethnography, and airspace struggles in Latin America

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The Starting Point

Geospatial technologies are not neutral instruments.

Historical Purpose

Territorial control, resource
extraction, military
operations

The Monopoly

The aerial perspective was
exclusive to powerful actors

The Change

Small drones now accessible
to communities



Can these same technologies serve environmental justice?

What Are Community Drones?

The utilization of small uncrewed aircraft **with** or **by** indigenous and local communities, responding to **their own needs and interests**—not external agendas.

Emergence

2012 — Pioneer experiences in Indonesia

2014 — Expansion in Latin America

Today — Growing regional network

Main Purposes

Environmental monitoring

Counter-mapping

Territorial defense

Resource management



Vargas-Ramírez, N., & Paneque-Gálvez, J. (2019).
The Global Emergence of Community Drones (2012–2017).
Drones, 3(4), 76. <https://doi.org/10.3390/drones3040076>

Community Drone Experiences in Latin America



Key Findings:

- Concentration in LA from 2014
- Commercial multirotor drones most common
- External agents drove most initiatives
- Local knowledge often underutilized

Why Are Drones Valuable for Communities?

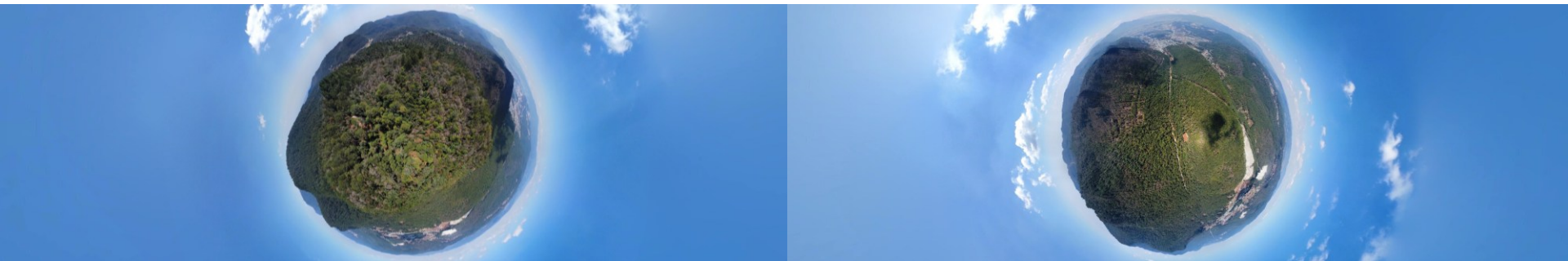
Satellite Imagery



Community Drones

- X Expensive acquisition
- X Complex processing
- X Limited temporal resolution
- X No control over timing

- ✓ Fly when needed
- ✓ Immediate results
- ✓ Very high resolution
- ✓ Full control



Drones document activities sometimes **only visible from above**: illegal logging, unauthorized clearing, water contamination, mining encroachment

Opportunities for Latin American Communities



Evidence Generation - Legally valid documentation

Governance Strengthening - Own spatial information

Generational Engagement - Youth involvement

Legitimacy Building - Counter degradation narratives

Epistemic Autonomy

The capacity to generate knowledge about one's own territory using one's own means



This connects with **equitable conservation**: a just transition requires communities become **producers** of environmental information, not merely **recipients**.

But drone flights alone are not enough. The data requires interpretation...

Integrating ethnographic methods with drone technology

An approach that integrates **situated local knowledge** with **remotely sensed data**, positioning the drone as an instrument for **co-producing knowledge** where community perspectives guide every stage.



The Limitation Observed

Connection with local knowledge is weak.
Drone becomes just another external tool.

The Engaged Approach

Transforms drone into extension of
community observation practices.

A methodology organized in three phases...

A Methodology in Three Phases

BEFORE TAKEOFF



DURING FLIGHTS



AFTER LANDING

PARTICIPATORY PLANNING

- Define purposes
- Identify áreas
- Local knowledge
- Risk assessment

ETHNOGRAPHIC OBSERVATION

- Researcher as (co)pilot/observer
- Document reactions
- Real-time transmission

PARTICIPATORY ANALYSIS

- Interpret images together
- Validate
- Collective decisions

Vargas-Ramírez, N., & Paneque-Gálvez, J. (2024). Unveiling Territorialities: Small Drones for Ethnographic Research on Environmental Conflicts. *Annals of the American Association of Geographers*, 114(10), 2370–2387. <https://doi.org/10.1080/24694452.2024.2380897>

Before Takeoff: The Most Important Phase



Participatory Planning Includes:

- **Collective definition** of flight purposes
- **Participatory mapping** to identify areas
- **Local knowledge** about actors and dynamics
- **Risk assessment** and ethical discussions

Methodological Opportunities

Unveil Territorialities

Power dynamics and spatial relationships invisible through conventional methods

Enrich Local Knowledge

Community members discover aspects previously unnoticed

Generate Robust Evidence

Documentation with technical validity and social legitimacy

The combination reveals what neither cartography nor ethnography could show independently.

This is Data Justice in Action: Communities controlling the **composition**, **access**, and **use** of data about their territories.

However, this progress faces a serious threat...

Criminal Appropriation of Drone Technology

Territorial Surveillance

Daytime and nighttime with thermal cameras

Psychological Operations

Intimidation and presence announcements

Movement Monitoring

Tracking authorities, journalists, monitors

Weaponization

Explosives or chemical agents (some countries)

Sophisticated Technological Ecosystems

Criminal groups integrate drones with Starlink, satellite imagery, and GIS. Some have **better mapping capabilities than state agencies.**

Geographic Intensity Gradient

Mexico	Peru / Panama	Guatemala	Bolivia
EPICENTER	SIGNIFICANT	GROWING	EMERGING
Most advanced: explosives, chemical agents, psychological warfare	Surveillance, intimidation, frequency jamming	Thermal surveillance, loudspeaker threats	Limited, primarily illegal mining

Uncrewed aerial narco-warfare: effects and challenges of its
deployment for community-based drone use in Latin America



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2025 AAG Annual Meeting

March 27, 4:10 - 5:30 PM | Virtual Paper | Session Gallery Geospatial Technologies



Critical Border Zones
Colombia-Peru-Brazil triple border
Colombia-Panama (Darién)
Mexico-Guatemala frontier

Uncrewed aerial narco-warfare: effects and challenges of its deployment for community
drones in LA

See detailed info about this slide on my YouTube Channel

Challenges for Communities

REGULATORY

- Expensive licensing
- Costs up to \$900 USD
- Evidence invalidation
- Possible bans

OPERATIONAL

- Forced recruitment
- Frequency jamming
- Self-censorship
- Equipment sabotage

PERCEPTION

- Drones: curiosity → threat
- Sound = danger
- Community fear



Implications for Just Transition

Criminal Organizations

- ✓ Transnational resources
- ✓ Advanced technology access
- ✓ Capacity to evade regulation

Communities

- ✗ Dependent on external funding
- ✗ Must navigate bureaucratic barriers
- ✗ Regulations designed without them

The fundamental problem: Restrictive regulations disproportionately affect legitimate users while barely inconveniencing criminal actors.

The consequence: If communities lose aerial monitoring tools, they lose critical evidence for defending their territories.

What can be done?

Airspace as Contested Territory

The **vertical dimension** of territory—long ignored in land rights discussions—demands attention. Who controls the sky above community lands?

*Indigenous
Communities*

Territorial defense

Governments

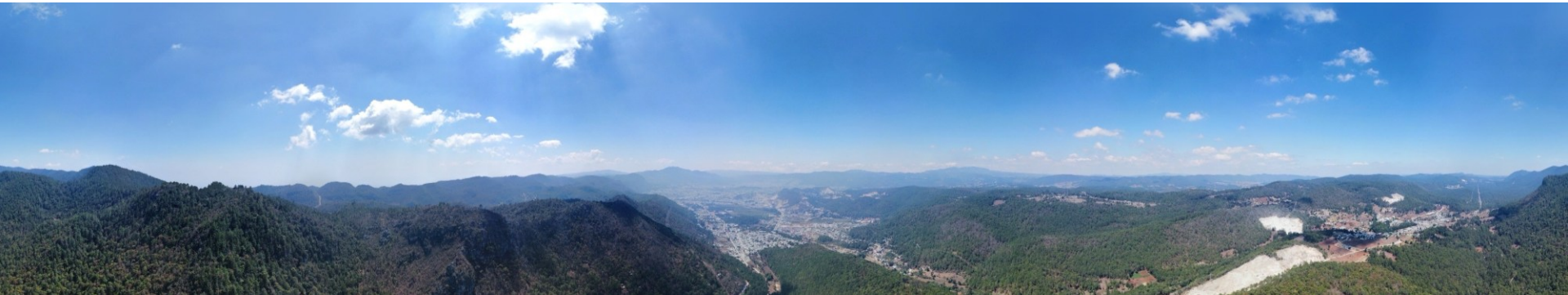
Regulation, security

Conservation Orgs

Environmental
monitoring

Criminal Groups

Territorial control



Capabilities once exclusive to states are now both **democratized** and **appropriated**. The outcome depends on regulatory decisions.

Principles for Differentiated Regulatory Frameworks

Recognition of Autonomy

ILO Convention 169: indigenous participation in airspace regulation

Protection of Monitoring Rights

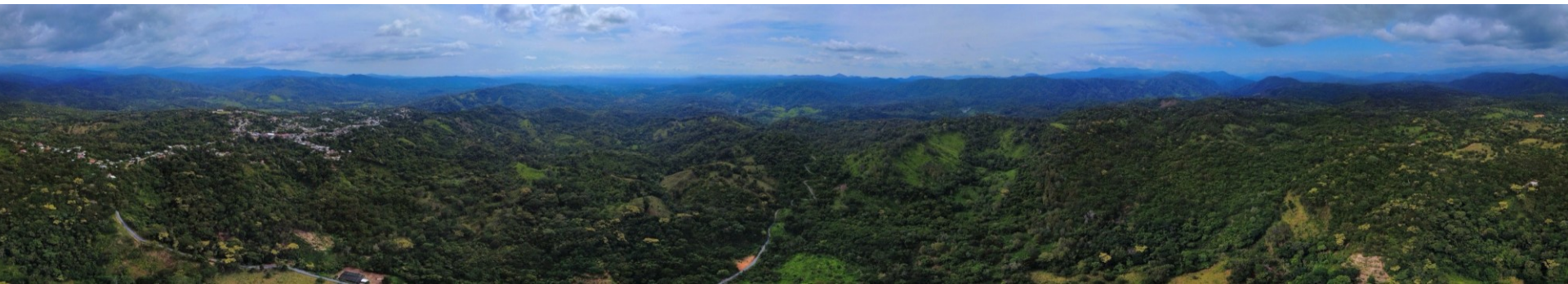
Communities must retain capacity to document from the air

Differentiation of Uses

Target harmful applications, not technology itself

Accessible Procedures

Economically and culturally appropriate accreditation



- Dignify monitor work
- Selective training with community backing
- Safety protocols

Regional Strategies

Across Latin America, organizations and communities are developing **shared strategies**:

**Share experiences
across borders**

**Develop safety protocols
collectively**

**Advocate collectively
for just regulations**



El uso comunitario de drones: ¿clave para la protección de los bosques habitados por pueblos indígenas y comunidades locales en América Latina?

The goal: Critical remote sensing grounded in place-based knowledge, supporting just transitions in environmental governance.

Conclusion

Geospatial technologies are not neutral. They can serve **domination** or **liberation**, **extraction** or **conservation**, **exclusion** or **justice**.

COMMUNITY DRONES

Counterhegemonic
practice—democratization
of aerial perspective

ENGAGED ETHNOGRAPHY

Instruments for co-
producing territorial
knowledge

THE THREAT

Criminal appropriation
triggers regulations
criminalizing legitimate use

Addressing this requires **differentiated frameworks** that recognize indigenous territorial autonomy and protect communities' right to employ these technologies for environmental justice.

A just transition must include just skies

Thank you
I welcome your questions and comments

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