Technology in Support of Securing Property Rights:
Unmanned Aerial Systems
Open Source Software
Crowd-sourcing/Citizen Engagement

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THE WORLD BANK
IBRD · IDA | WORLD BANK GROUP

Food and Agriculture Organization of the United Nations

International Development Context

The World Bank's Twin Goals

FAO's goal
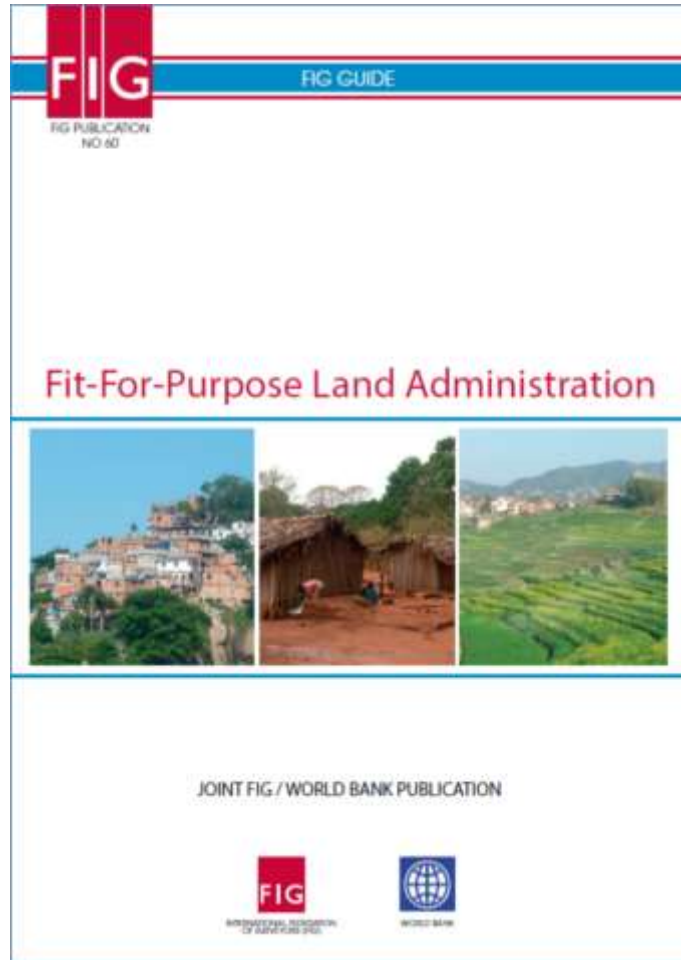## End Hunger and Poverty

THE WORLD BANK GROUP GOALS

END EXTREME POVERTY AND PROMOTE SHARED PROSPERITY

WORLD BANK GROUP

Food and Agriculture Organization of the United Nations

Global Need for Improved Land Administration

Fit-For-Purpose Land Administration

JOINT FIG / WORLD BANK PUBLICATION

Paradigm Shift Needed

- **75 percent** of the world's population do not have access to formal systems to register and safeguard their land rights.

- There is an urgent need to build **affordable and sustainable** systems to identify the way land is occupied and used.

- The key bottleneck in land administration services is the **use of traditional, high accuracy, expensive land surveying techniques** to record land rights.

Physical Condition of Cadastre Maps

Data Quality is an Issue!

Official Map ≠ Reality

2014 UAS: Pilot Areas in Albania

**Rural Area
with large
infrastructure
investment**

Dense Urban

**Peri-urban:
rapid urbanization
often informal**

Time and Cost Savings:

Rural area: 2 weeks of conventional surveying completed 2 days
Hilly peri-urban area: 2-3 months in 5 days

Orthophotos produced locally: 48-72 hour turn around with 2 cm resolution

Fushe Milot
Orthophoto Map

Cost Considerations:
Off-the-shelf Parts + Open Source Software

Airframe: Quad 4, take off weight 2.4 kg from South Africa

Camera: Nikon 20MP, 16mm lens ($ 450)

Central flight controller: APM 2.6 from 3DR inc. (open source)

Image processing: Photoscan (Agisoft) $3500

The price of the platform = a common GNSS rover unit

Quadcopter: Payload 0.75kg, Endurance: 15min

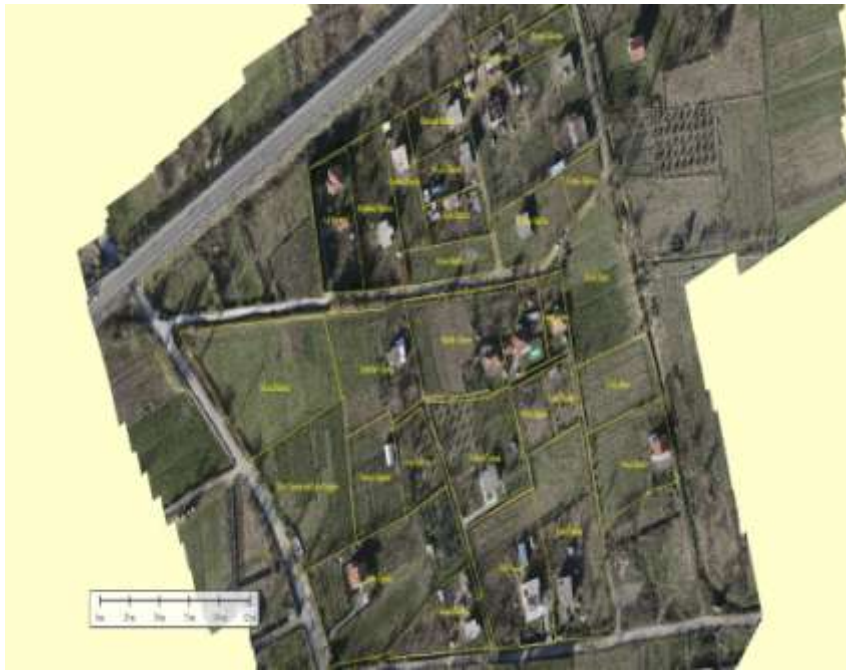# Citizen Engagement in Defining Boundaries

Aerial images from the UAV were shared with community members within minutes of flying

Property owners easily identified their boundaries on the orthophotos
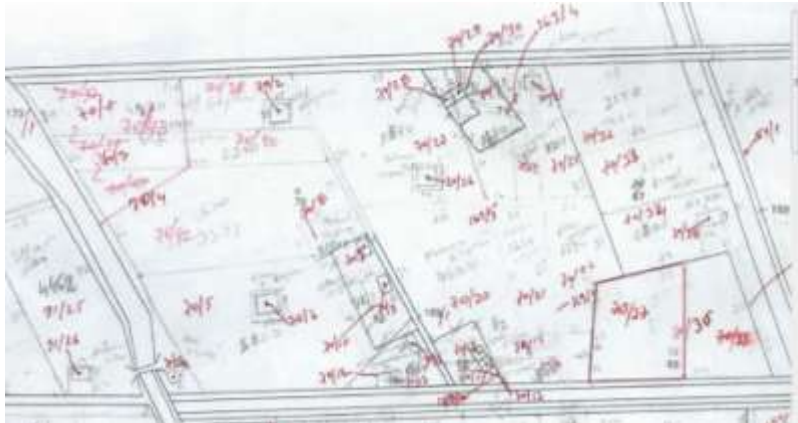
Now the hard work starts

The Owners and the Property Boundary in the Field

Cadastral Maps

"Mother" parcel No. 70

Fig.1 CM has no property data (is empty) Fig.2 FR field map
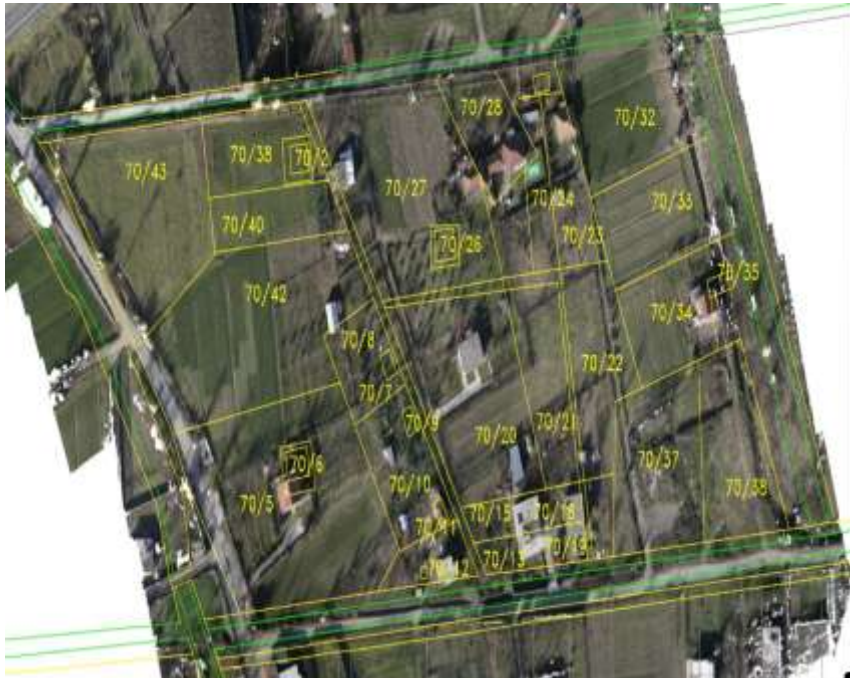
"Mother" parcel No. 43

Fig.1 CM of First Registration

Fig.2 CM updated manually

Overlap Orthophoto

"Mother" parcel No. 70
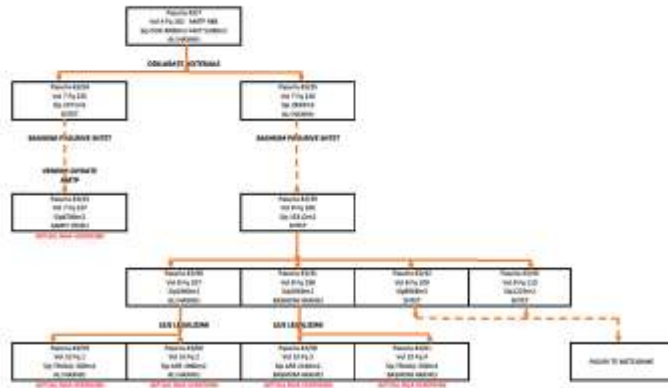There are changes of the physical boundary

"Mother" parcel No. 43

The new road is not updated in the CM

Review of legal status

Example: Chain of ownership for 1 property with both formal and informal transactions

Properties where the official registration data differ from the self-declared owners

OPEN TENURE SOFTWARE
(open source solution)

Open Source- customizable
Cloud technology for data hosting
Import/export data
Citizen-centric focus/work flow

http://www.fao.org/fileadmin/user_upload/nr/land_tenure/OPEN_TENURE.pdf

Multi Purpose Use

Infrastructure: Design and Contract monitoring

DRM:
Post flood scenario

Pending failure of the embankment

3D models

Conclusions

UAS-based Approach is an effective methodology for:

- ✓ Acquiring **current high-res imagery** for multiple purposes
- ✓ Creating virtual models for realistic **visualization**
- ✓ **Measurement** on virtual models replacing lengthy field surveying
- ✓ Promoting **participation** of landholders and other stakeholders

Conventional approaches vs. UAS-based methodology offers:

- ✓ Significant **cost-** and **time savings** (days vs months or years)
- ✓ **Transferable** technology - facilitates development and decentralization of mapping capacity and stimulates/broadens local innovation

In line with Fit-For Purpose Principles:

Flexible spatial data capture, on-demand
Incremental approach allowing for 'just-in-time' spatial data provision
Upgradeable with incremental improvement over time
Participatory with and for the community
Attainable within timeframe and available resources

In line with broader e-government/NSDI agenda...

Thank you!