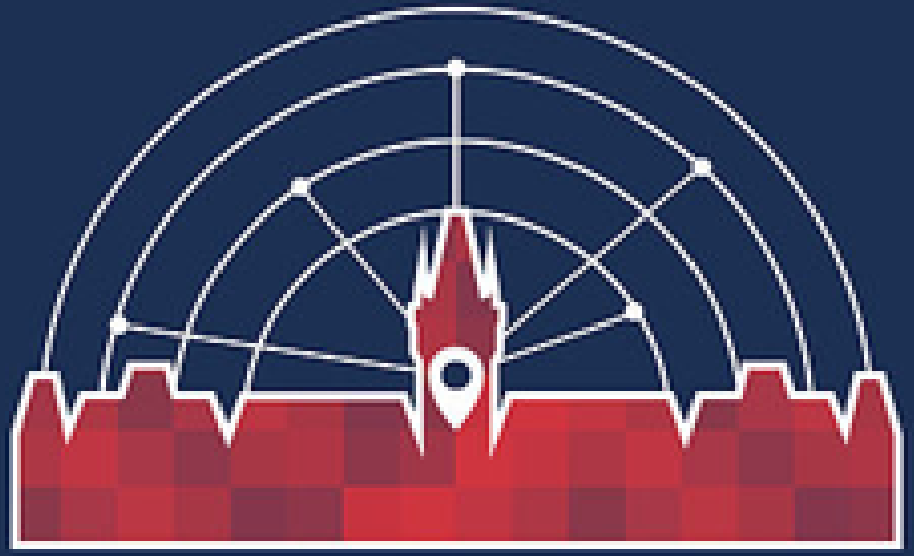


FIG Commission 3 Workshop and Annual Meeting
International Symposium Geomat
and EGoS General Assembly

FROM VOLUME TO QUALITY
**BRIDGING THE GAP FOR SPATIAL DATA INSTRASTRUCTURE**

Iași 3|7 November 2016

National Technical University Of Athens
School of Rural and Surveying Engineering

# A proposal for fast, flexible, low-cost and reliable Cadastral Surveys

**Konstantinos Apostolopoulos**, Surveying Engineer , MSc
**Charalabos Ioannidis**, Professor
**Chryssy Potsiou**, Associate Professor, FIG President

## Sustainable Development Goals (SDGs)

**Six goals** with a significant land component mentioned in the targets

- Goal 1 - No poverty
- Goal 2 - Zero hunger
- Goal 5 - Gender equality
- Goal 11 - Sustainable cities and communities
- Goal 15 - Life on land
- Goal 16 - peace, justice and strong institutions.

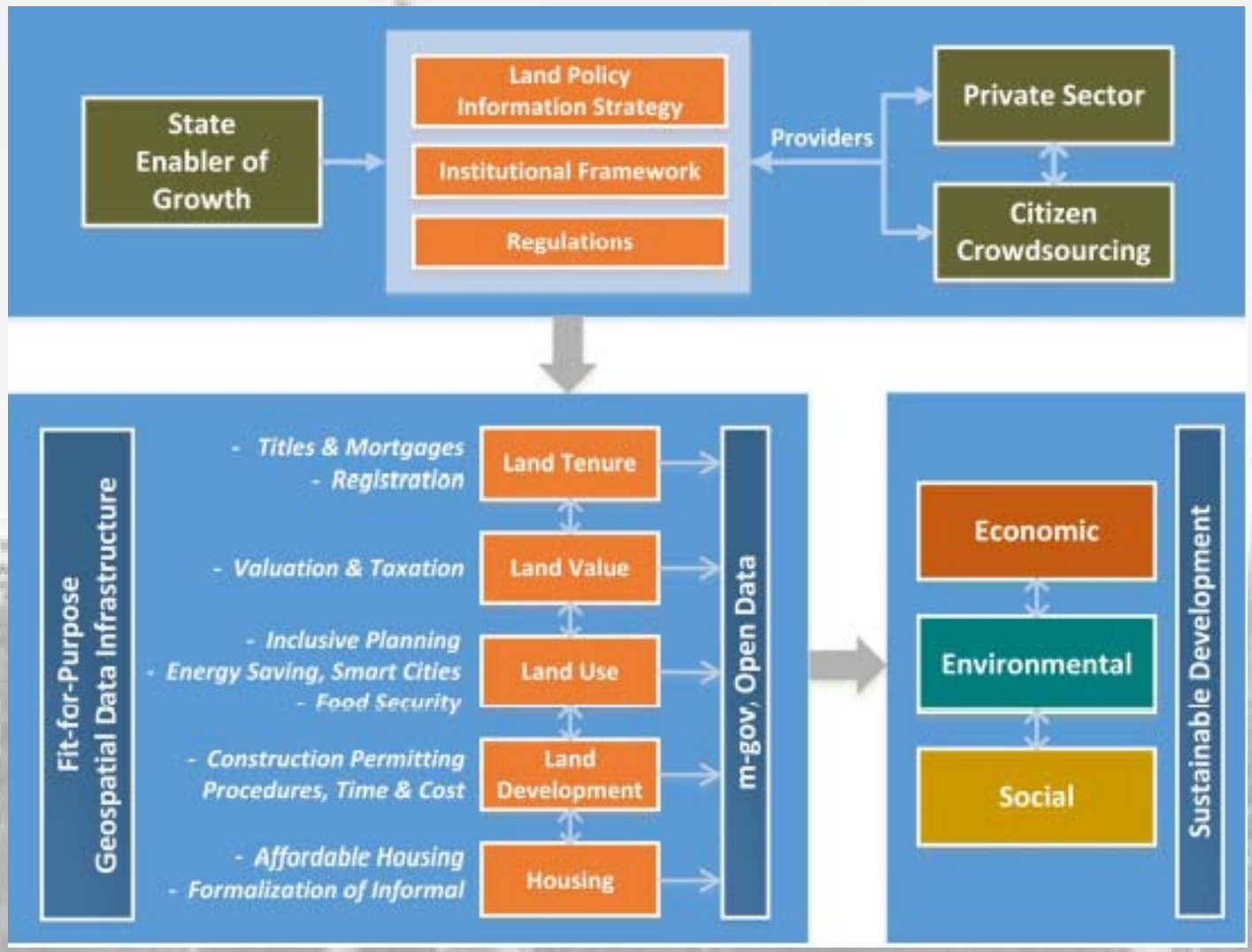
## Sustainable Development Goals (SDGs)

- **good land governance**
- **wellfunctioning country wide land administration systems**

## Modern Land Administration

systems are expected to deliver, the **necessary infrastructure** related to:

- ✓ **land tenure**
- ✓ **Land value**
- ✓ **Land use**
- ✓ **Land development**
- ✓ **Housing**



## Land Administration Systems advantages:

- Governance support and safety
- Protection of public property
- Poverty reduction
- Land conflicts management
- Land tenure safety
- Good land development
- Real estate support
- Infrastructure development
- Investments security
- Environmental and natural resources management
- Land and property taxation
- Data and statistics management

**Global effort to:**

✓ Reduce costs
✓ Simplify the procedures

## Fit-For-Purpose approach


**Three** fundamental characteristics:

- ❖ **Focus on the purpose**
- ❖ **Flexibility**
- ❖ **Incremental improvement**

**Three** core components:

- ❖ **Spatial framework**
- ❖ **Legal framework**
- ❖ **Institutional framework**

# Main stages of the Hellenic Cadastre Survey

- Declaration of a specific area under cadastral survey, tender, bid submission, temporary office for cadastral survey
- Provision of orthophoto by NCMA
- Compilation of draft cadastral maps by the surveyors/contractors
- Collection of existing information from other projects in the area
- Submission of property rights declarations by the right holders
- Submission of any new changes in the cadastral data (subdivisions, transactions, etc.) by the right holder
- Processing of declarations and additional data; compilation of preliminary cadastral maps by the surveyor/contractor
- Pre-publishing of the collected info
- Field surveys in case of missing information
- Publishing of the preliminary cadastral data (maps & tables)
- Objection submission by the right holders
- Examination of objections
- Correction of the preliminary cadastral data and ratification & initial registration
- Replacement of the Land Registry by a permanent Cadastral Office


Cadastral manual for the citizen

# HELLENIC CADASTRE ISSUES

- Vague land tenure (in many areas the objections were observed to exceed in number the cadastral registrations)
- Local legislation (Ionian Islands law system)
- Public sector deficiency to meet project's demands
- Not defined and published forest maps and coastal zones in under Cadastral Survey areas
- Inaccurate property declarations
- Lack of information regarding legal consequences
- Lack of legal titles in abandoned rural areas – non defined parcels – non identified properties

# Proposed process for Cadastral Surveys

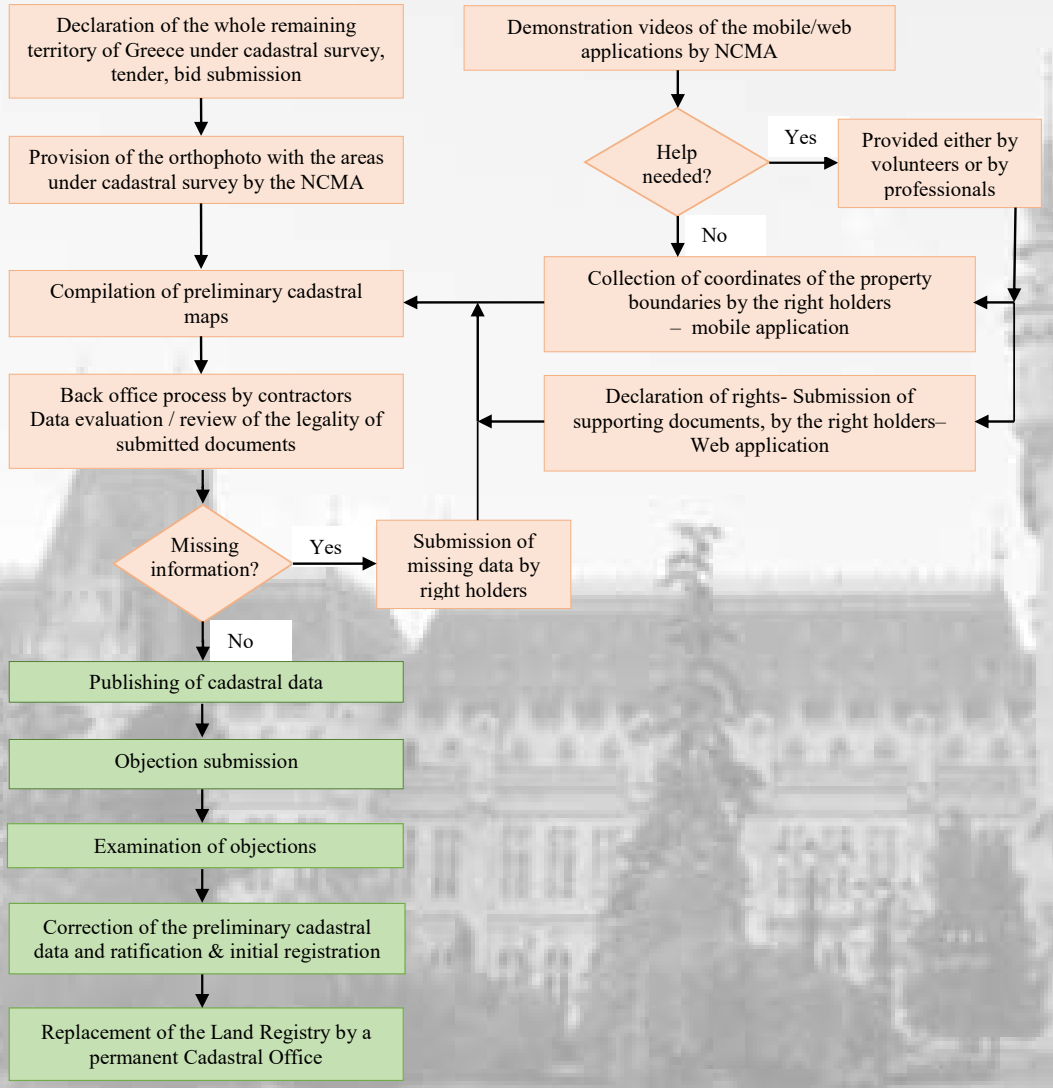
**Core** components

- Citizens participation (**CrowdSourcing**)
- Usage of **IT tools**, mobile devices, low cost commercial and in-house software, m-services etc.

Scope

- Eliminate the **cost** and **time**
- Improve the **reliability** of collected data
- **Completion** of the National Cadastral Survey

# Proposed procedure for Cadastral Surveys




- **Phase 1**

Compilation of preliminary cadastral maps – Declaration of rights

- **Phase 2**

Back office process – Data evaluation

- **Phase 3**

Publishing of cadastral data

- **Phase 4**

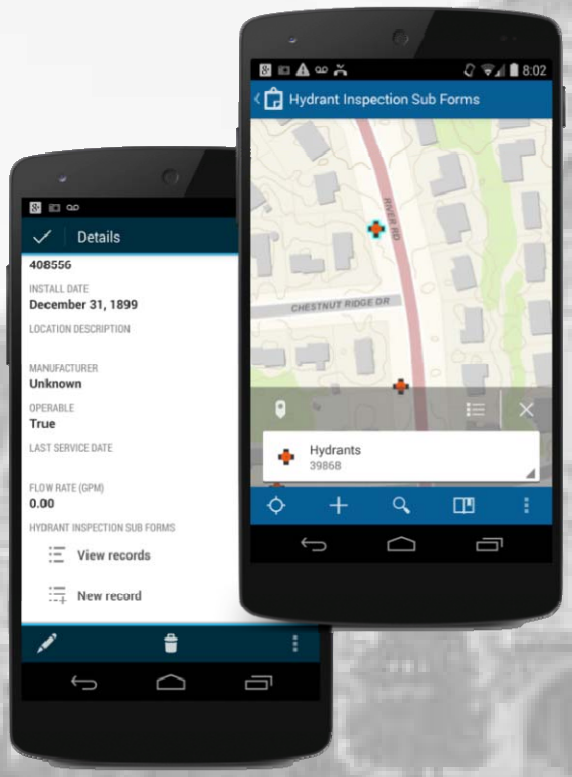
Objections – Initial registration

## Use of mobile applications

- Esri's Collector for ArcGIS
- BoundGeometry

ESRI's **Collector for ArcGIS** consists of:

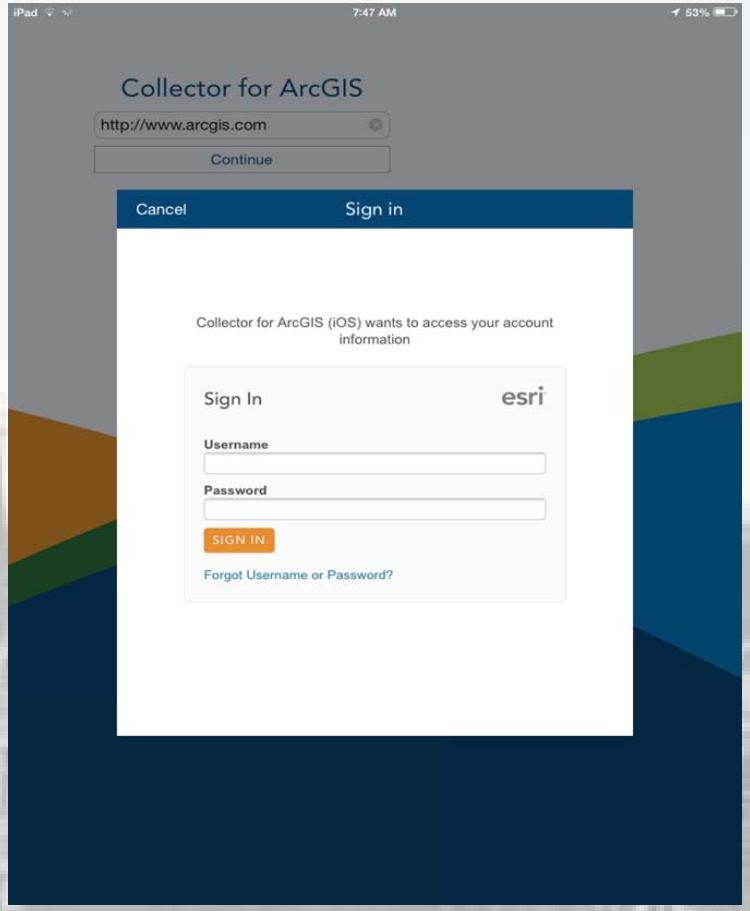
- The **server side**
- The **client side**



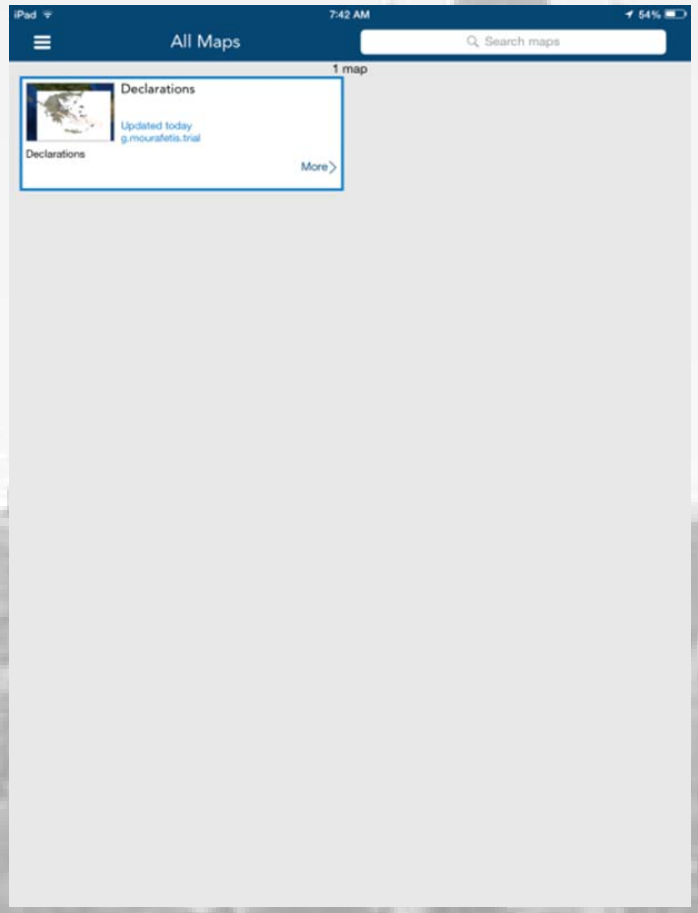

## Applications' Capabilities

- **Parcel boundaries digitization**
- **Building boundaries digitization**
- **Collection of parcel's images**
- **Collection of parcel's data ownership**

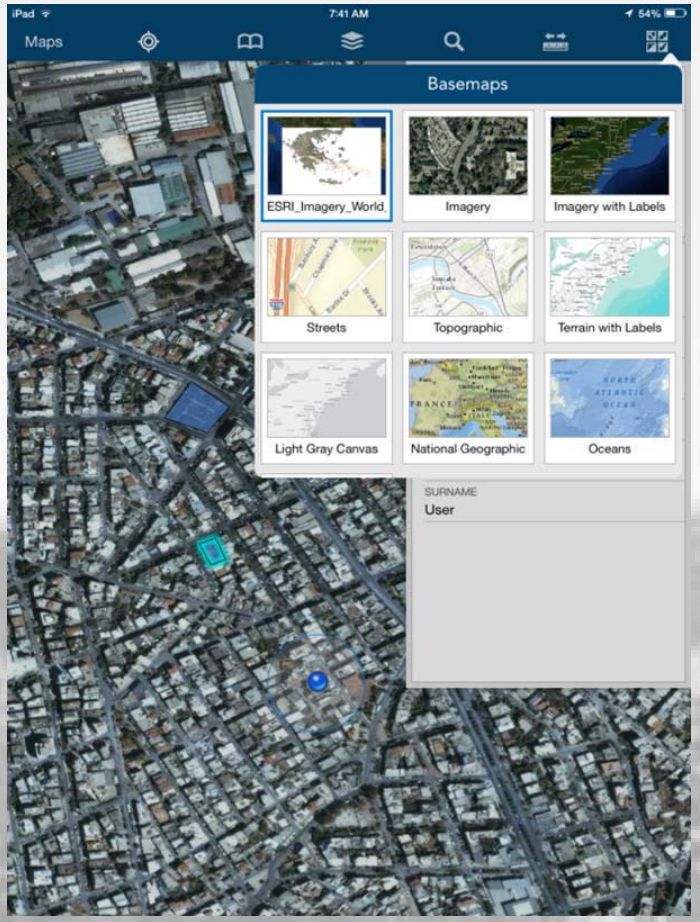
## Sign in




## Selection of Cadastral Map

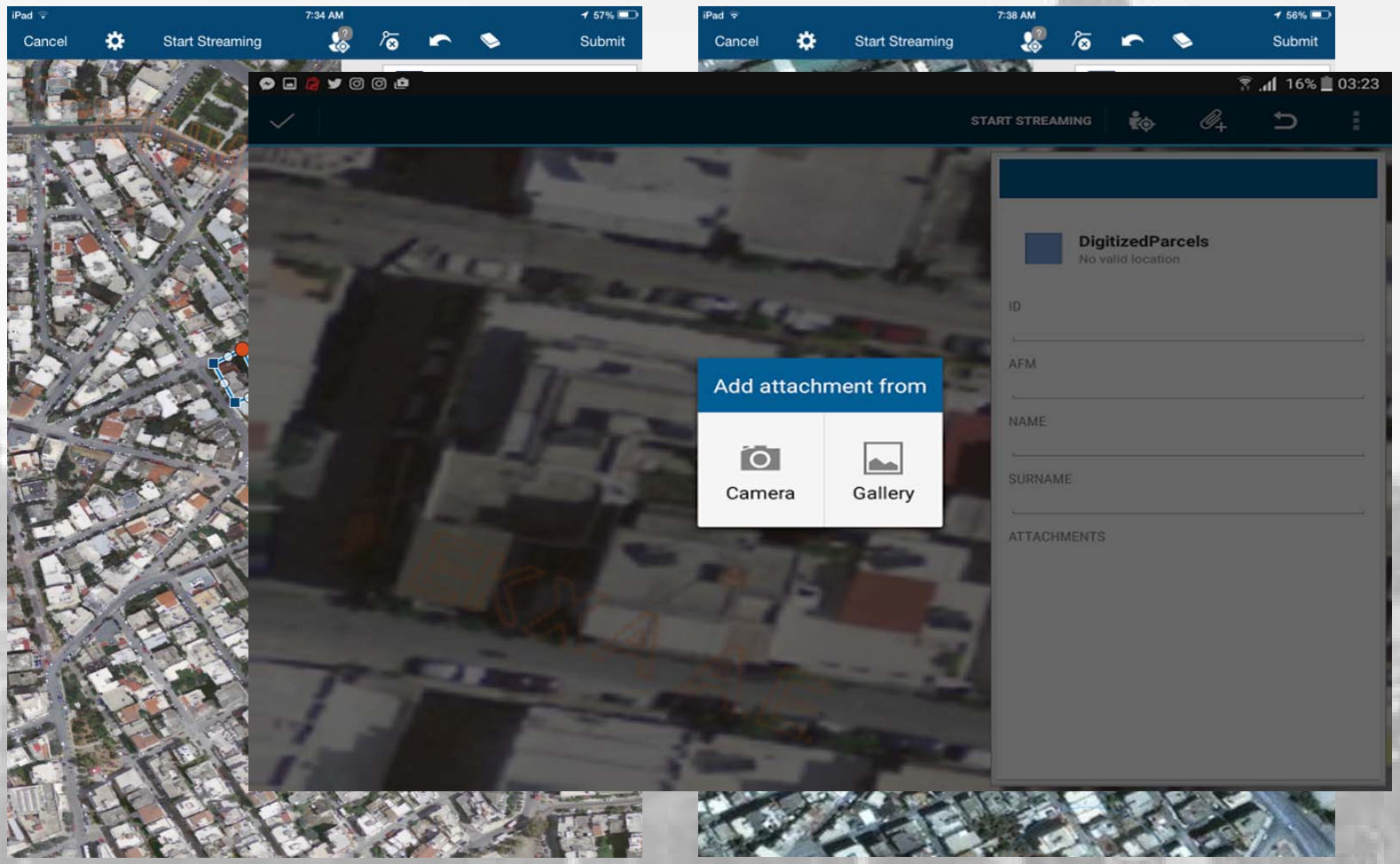



## Basemap's Selection



## Parcel’s data collection

## Impovement of parcel nodes



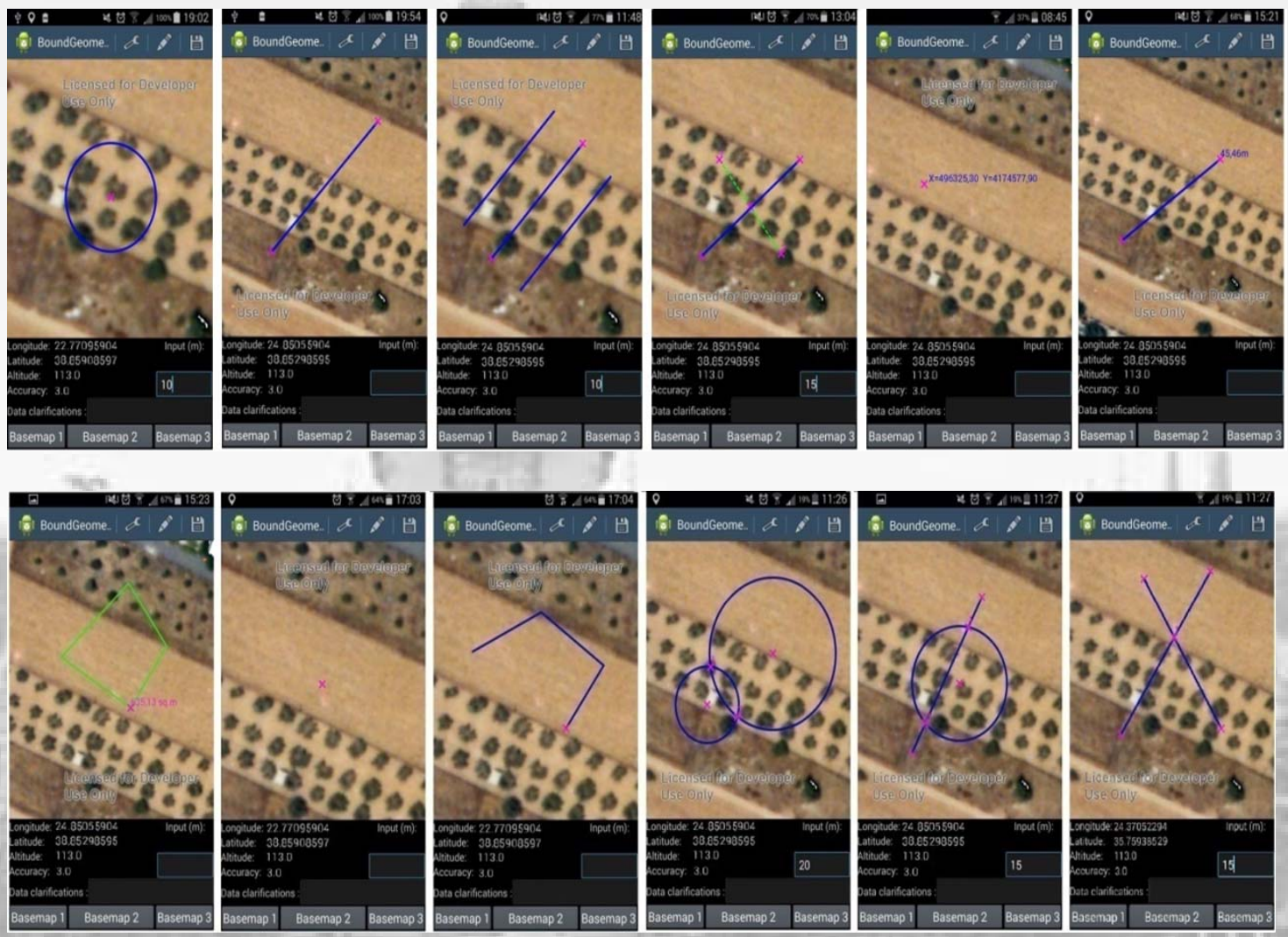

## Additional data upload tool

# BoundGeometry

**BoundGeometry** application provide user with additional **geometric tools**

It is an **assisting** application for the Collector for ArcGIS in cases:

- **Geometrical Restrictions**
- **Parcel Boundaries Distortions** (e.g. trees and vegetation hiding points)



## Video guide

This video guide aims to raise citizen awareness for the Cadastral Surveys and how to participate with their mobile devices.

It is a **simple**, **step-by-step** guide of:

- **Applications**
- **Their features and their tools**

**Any Citizen can be informed and trained how to identify his/her parcel on the orthophotos and digitize it properly**

ESRI'S COLLECTOR FOR ARCGIS
+
BOUND GEOMETRY

VIDEO GUIDE

**Applications target group**

- **Any age group**
- **Any educational background**
- **Any digital capacity**

# ESRI'S COLLECTOR FOR ARCGIS

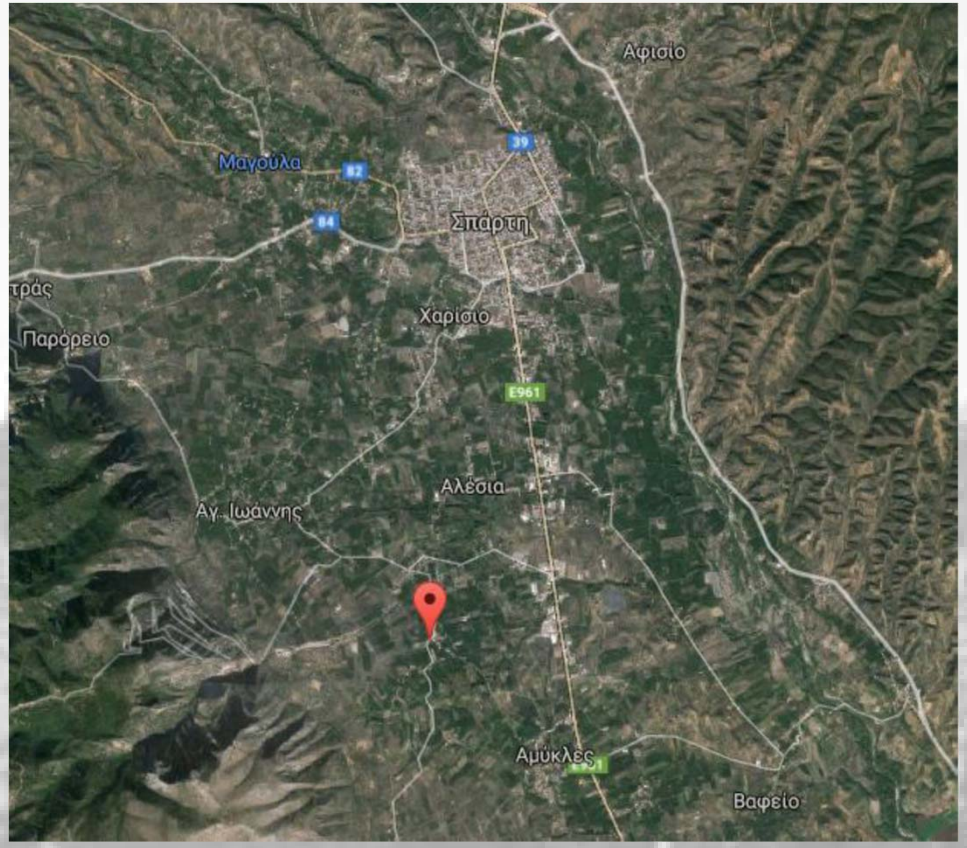
# +

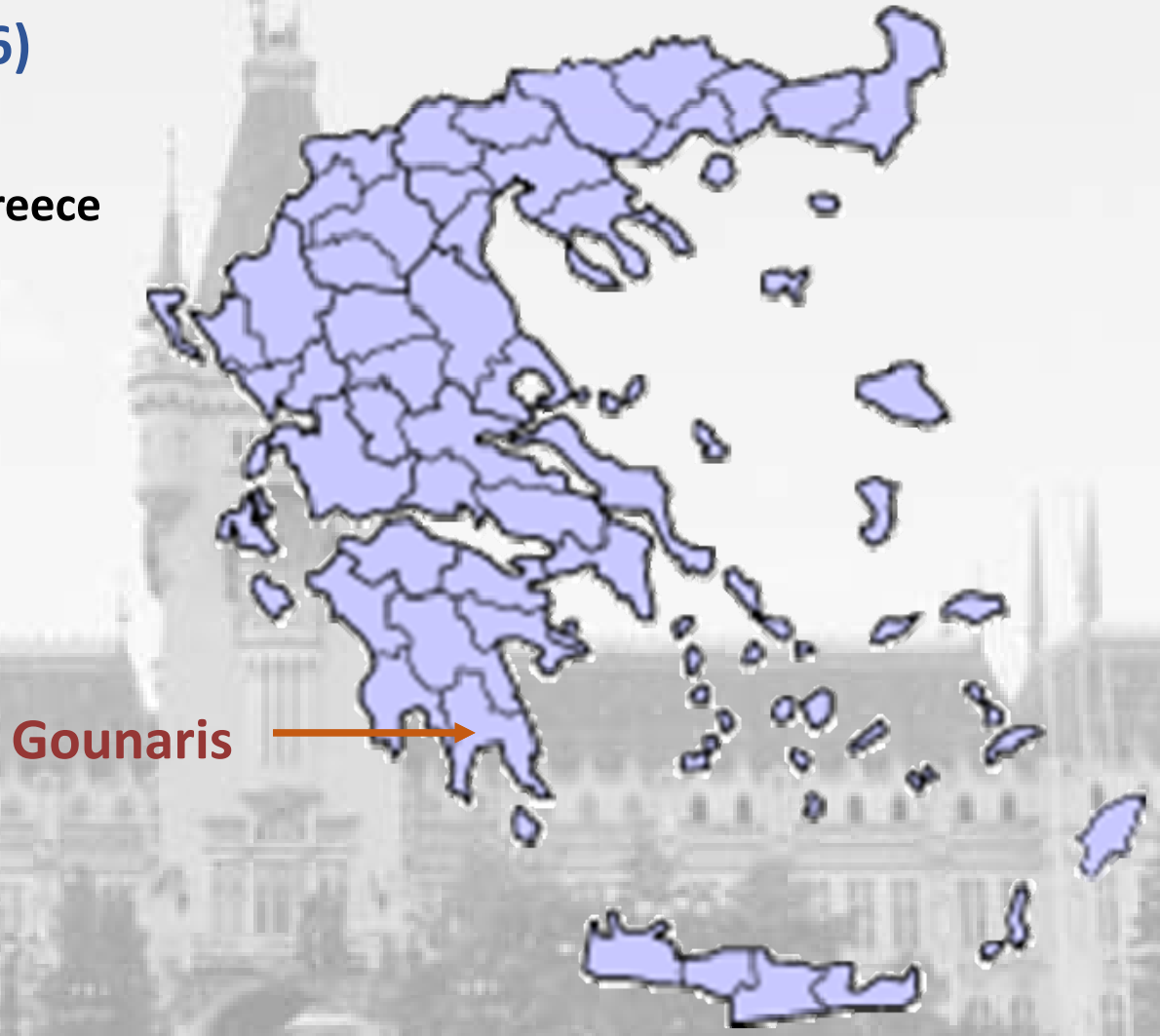
# BOUND GEOMETRY

## VIDEO GUIDE

# Pilot Case study in a Rural area (1/6)

**Gounaris, Municipality of Sparti, Lakonia, Greece**



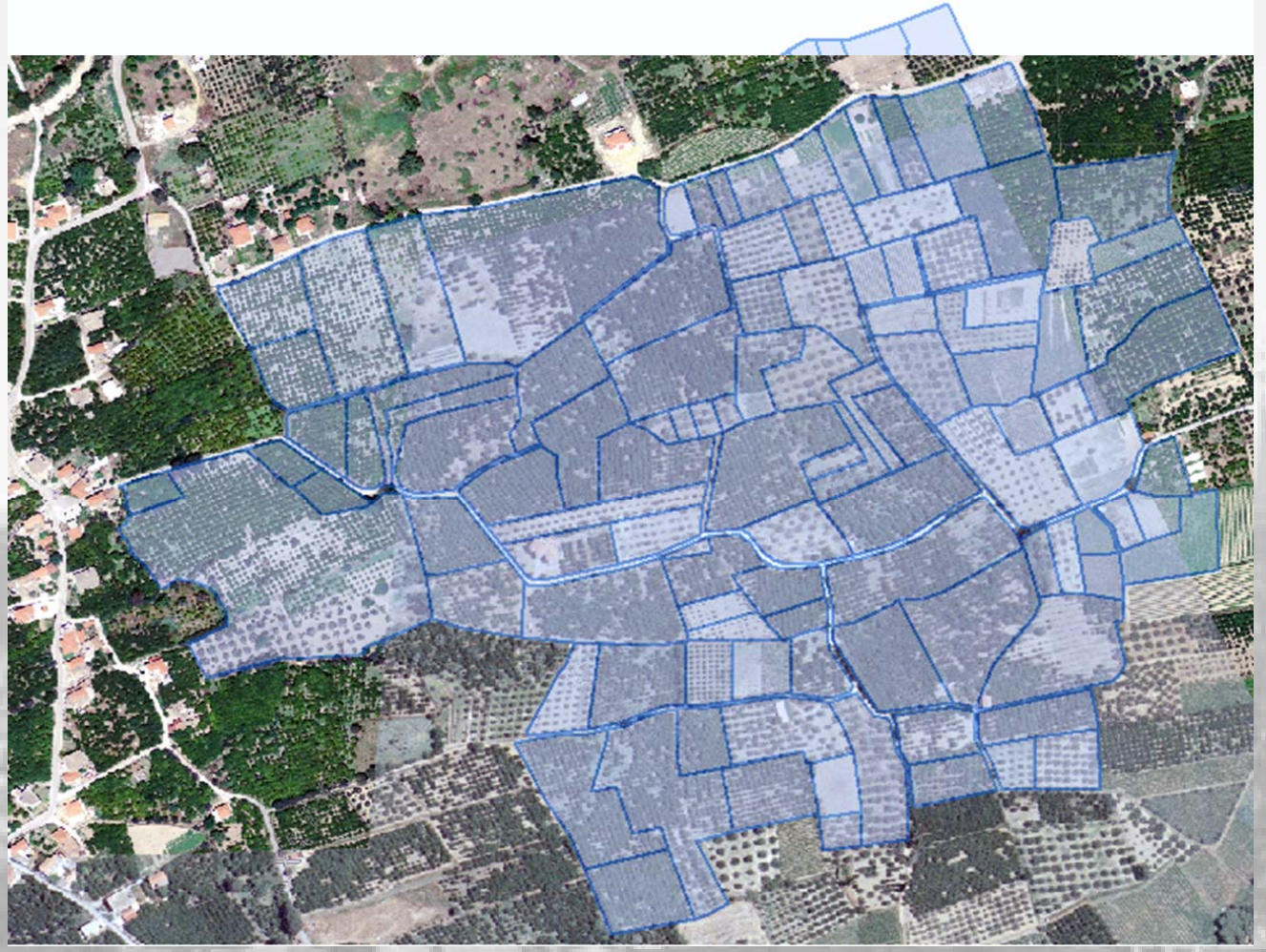
## Pilot Case study in a Rural area (2/6)

- **Time**: **August 2016**
- **Basemap: orthophoto of the NCMA**
- **Team: 27 volunteers + 1 surveyor → digitized 114 land parcels (~ 450 acres)**
- **Lso: 0.5 m**
- **Entire process time: 15 hours (3 days x 5 hours)**
- **Application: Esri's Collector for ArcGIS**
  **BoundGeometry** (application was not of much help due to the random shape of the parcels)

# Pilot Case study in a Rural area (3/6)

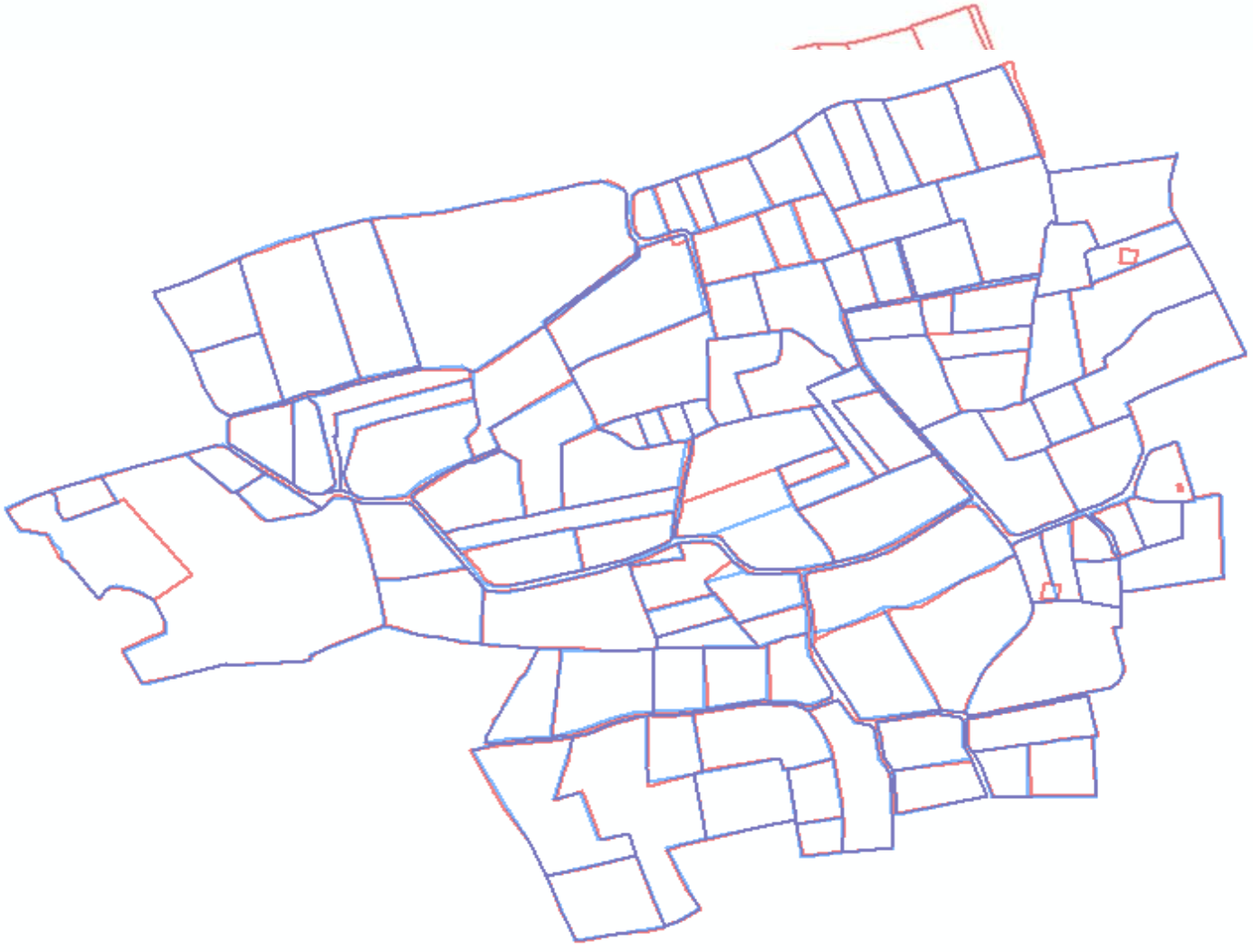
**Main problems**:

- Shifting of property boundaries
- Missing property boundaries (that are not marked on the ground)
- Complex property boundaries (inaccurate digitization)



# Pilot Case study in a Rural area (4/6)

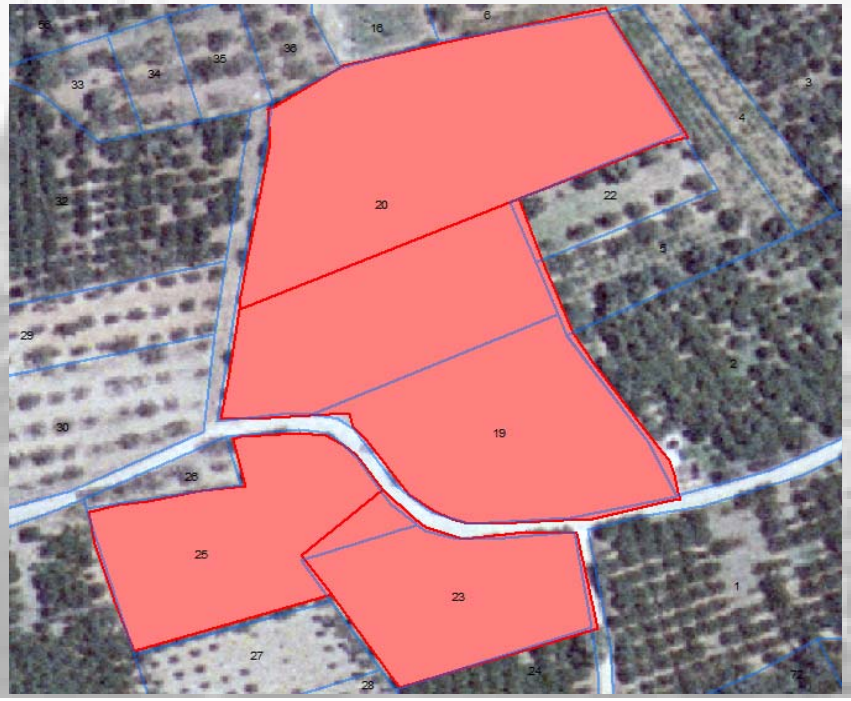
Comparison with NCMA's Cadastral Map of the area (NCMA)



# Pilot Case study in a Rural area (5/6)

Only **5/114** land parcels with obvious errors at their boundaries (land parcels no19, 20, 23, 25, 43)

- Land parcels no19 and 20 have different property boundaries
- Land parcels no23 and 25 are separated in a different way
- Land parcel no43 is presented as 2 different land parcels (possibly by mistake during the formal Cadastral Survey)



# Pilot Case study in a Rural area (6/6)

## Comparison with NCMA'S Cadastral Map

**Slight Variations in shape & orientation**

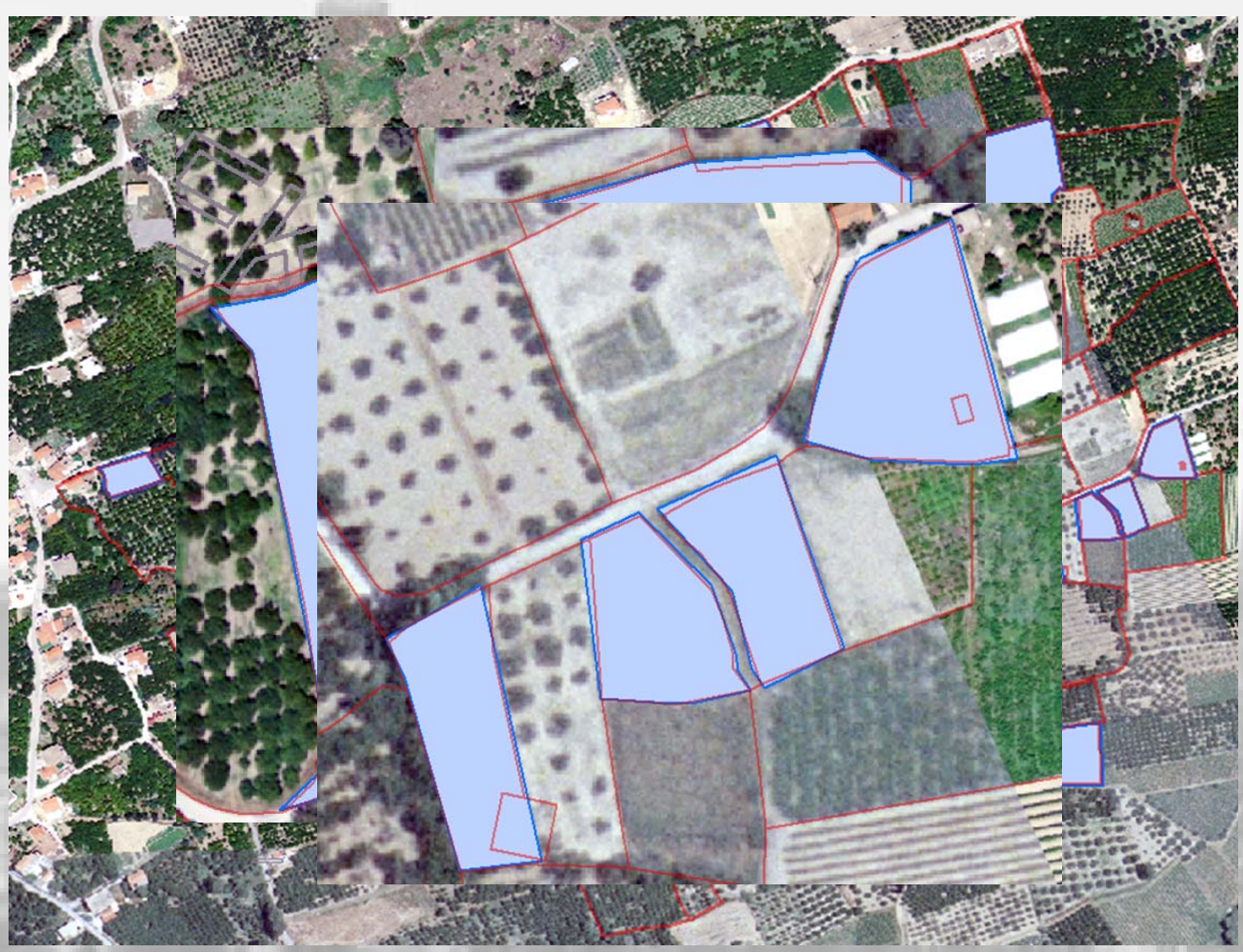
## NCMA'S technical specifications:

**$Rms_{xy}$ for rural areas is 1.41m**

Only **17/114** land parcels exceed these specifications (**14.9%** of the digitized crowdsourced land parcels)

**Average deviation → 0.55m**

**Max deviation → 1.8m**



# Conclusions

- A fast, flexible, low-cost and reliable procedure is proposed
- Combination of commercial IT tools + In-house developed Software
- Motivation and active participation of citizens was satisfactory
- Resulted accuracies cover NCMA's technical specifications for rural areas

✓ Advantages:

1) Safe identification of land parcels by owner or neighbors
2) Cost reduction for collection of cadastral data → work of volunteers
3) Significant time reduction

**Thank you for your attention!**