GIS Implementations and Developments

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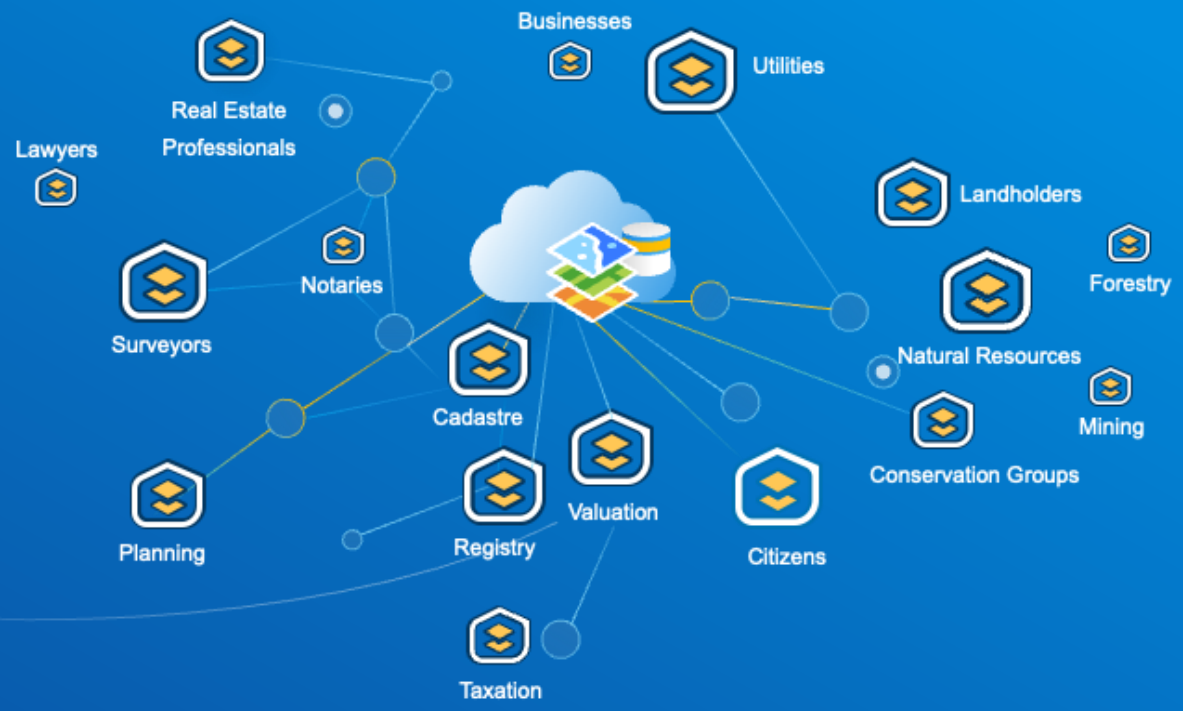
Thursday September 26, 2024

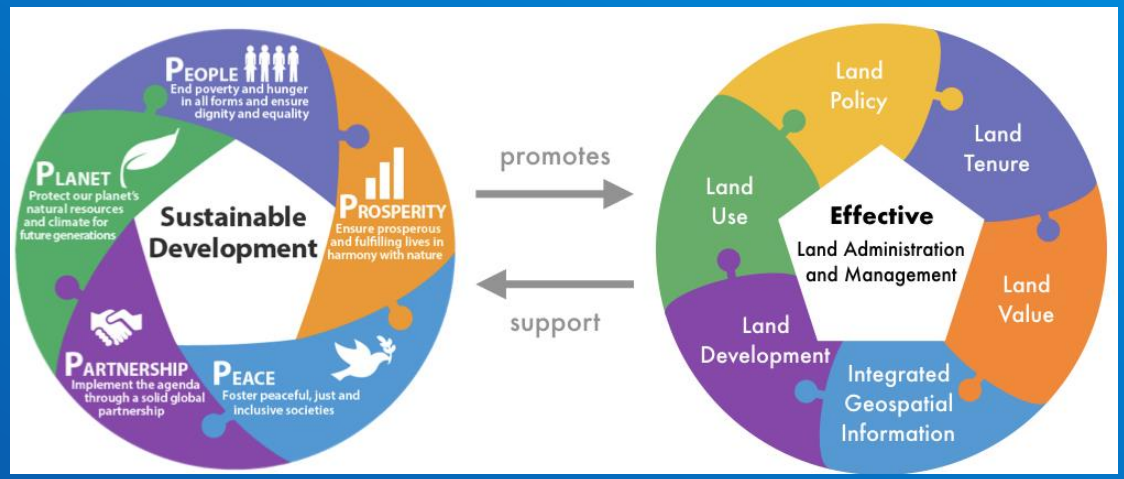
Overview

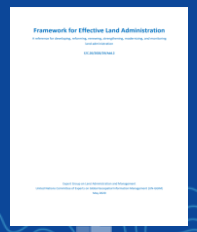
- Guiding principles
- GIS and cadastral system development
- Requirements of GIS based LAS
- Parcel Fabric
- Examples
  - Cyprus, Morocco and Hong Kong
- Conclusions

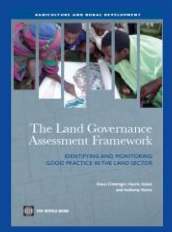


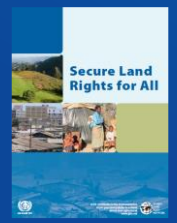
Guiding principles

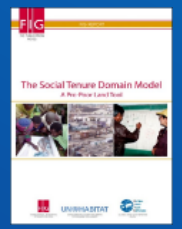
- Guidance
  - UN GGIM - Integrated Geospatial Information Framework (IGIF)
  - UN GGIM - Framework for Effective Land Administration (FELA)
- Methods and approaches
  - Land Administration Domain Model (LADM; ISO 19152)
  - Fit for Purpose Land Administration (FFP)
- Scalable solutions
  - Technology (like the Esri's ArcGIS and Parcel Fabric)

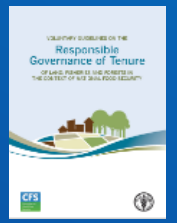


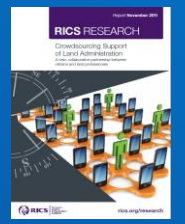












GIS and cadastral System Development

A Platform for Land Administration

Collect

- Attribute
- Survey
- Geodetic
- BIM
- Drone
- Field
- Satellite

Manage

- ***LADM***
- ***QA/QC***
- ***Standardized workflows***

Online content
Web Services

Analyze

GeoAI

Dashboards

Value Property

Spatial Adjustment

Produce

Cadastral map

Valuation Roll

Addresses

Titles/Deeds

Open Data

Share

Stakeholders

Planning

Utilities

Surveyors

Banks & Financial Institutions

Emergency Response

Tax & Valuation

Housing

Executives

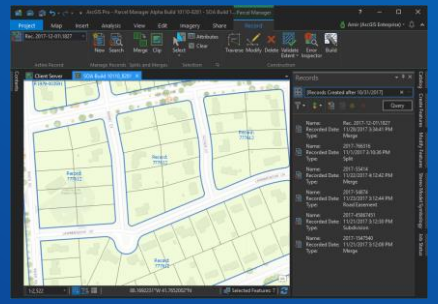
GIS and cadastral system development

Collect → Manage → Analyze → Share

Field Operations

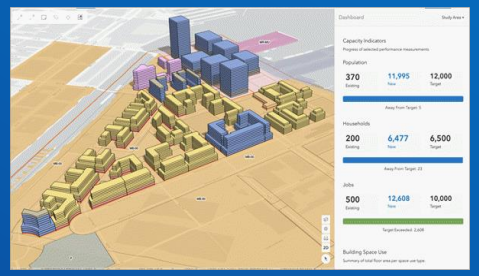
- Fit for purpose, LADM
- First registration
- Workforce Management
- Field capture of parcels and attributes
- Drone imagery

Parcel Management



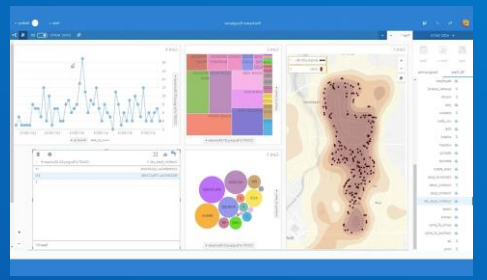
- Parcel Fabric in Pro
- Built in quality management
- Parcel history
- Spatial adjustment

Land Use Planning



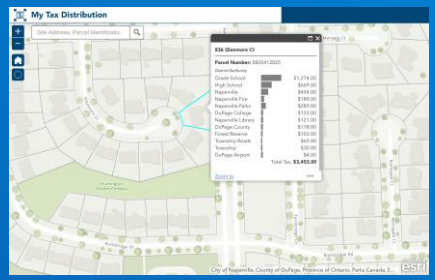
- Create zoning and land use plans
- Visualize projects
- Report on indicators
- Increase engagement

Property Valuation



- Geo-enrichment
- Data visualization and exploration
- Spatial Modeling & Value Prediction

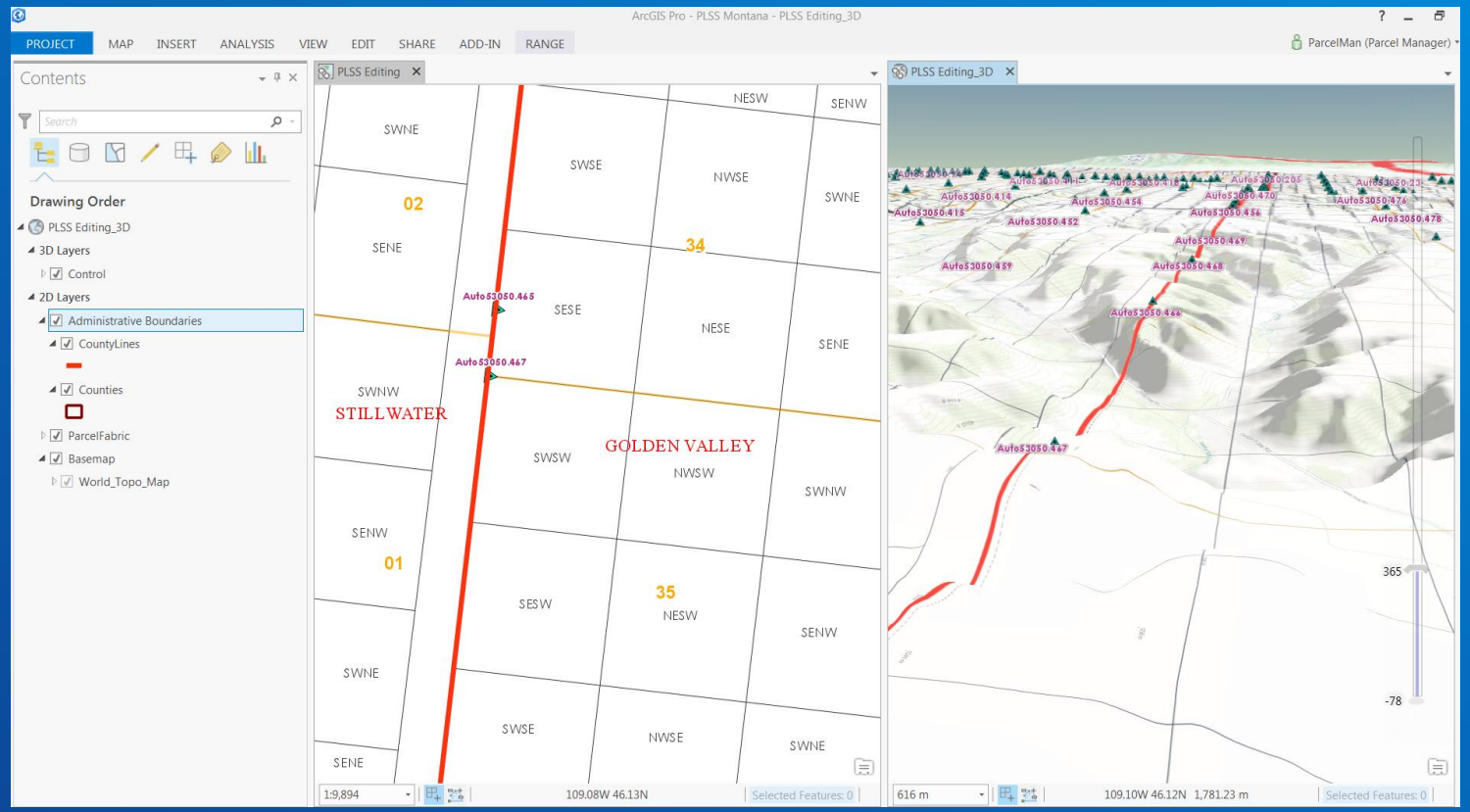
Stakeholder Engagement



- Open data and SDI
- Community engagement
- Public-facing maps & apps

Requirements of GIS based Land Administration System

- Cost
- Customization
- Configuration
- Reliability and Support
- Integration
- Advanced Features
- Transparency
- Learning Curve
- Documentation
- Compatibility
- Security
- ....



Scalable, Sustainable, Stable, Secure

(Fit for Purpose)

Projects

Systems

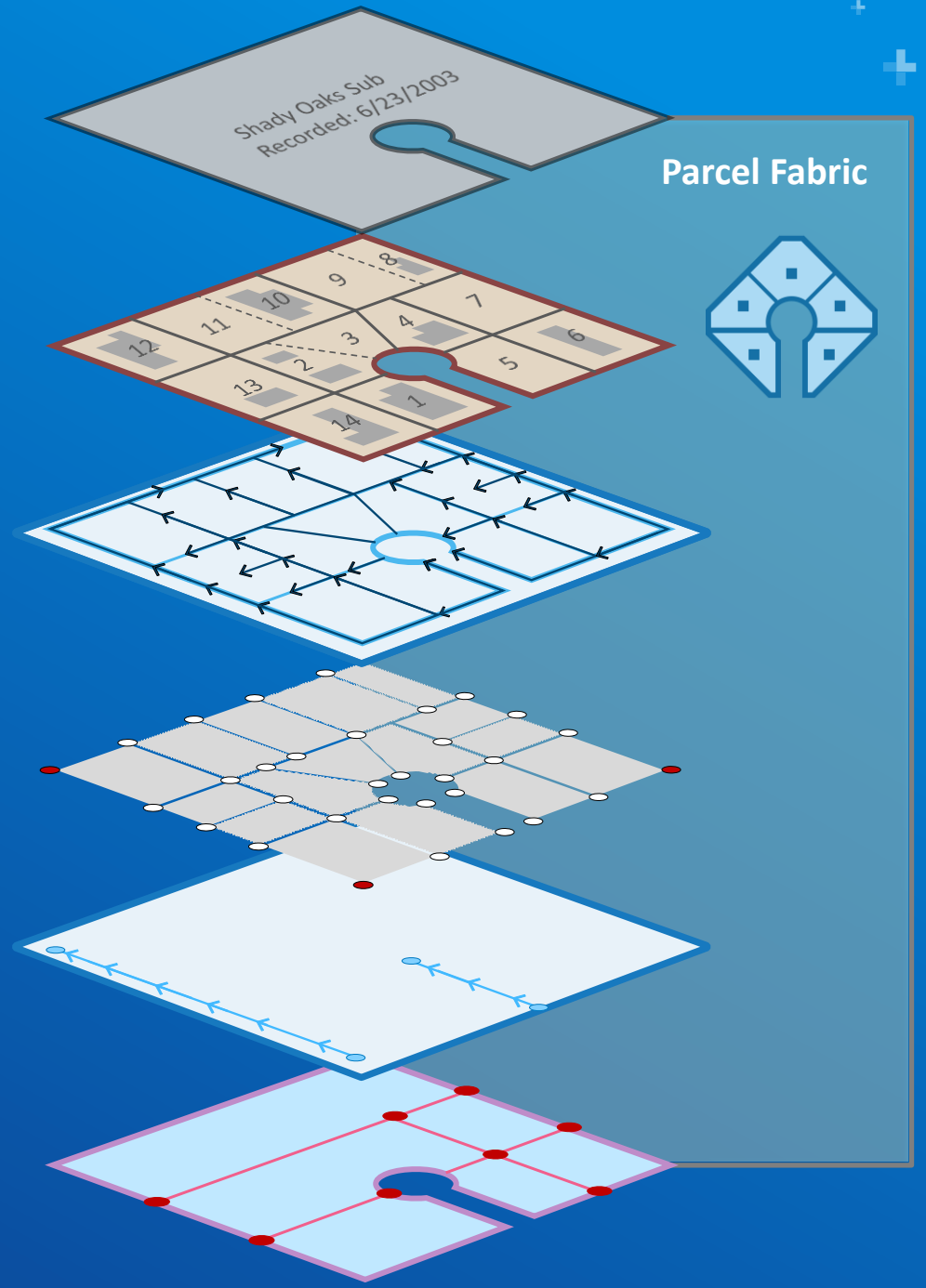
Cloud Services

Geospatial Infrastructure

(System of Systems)

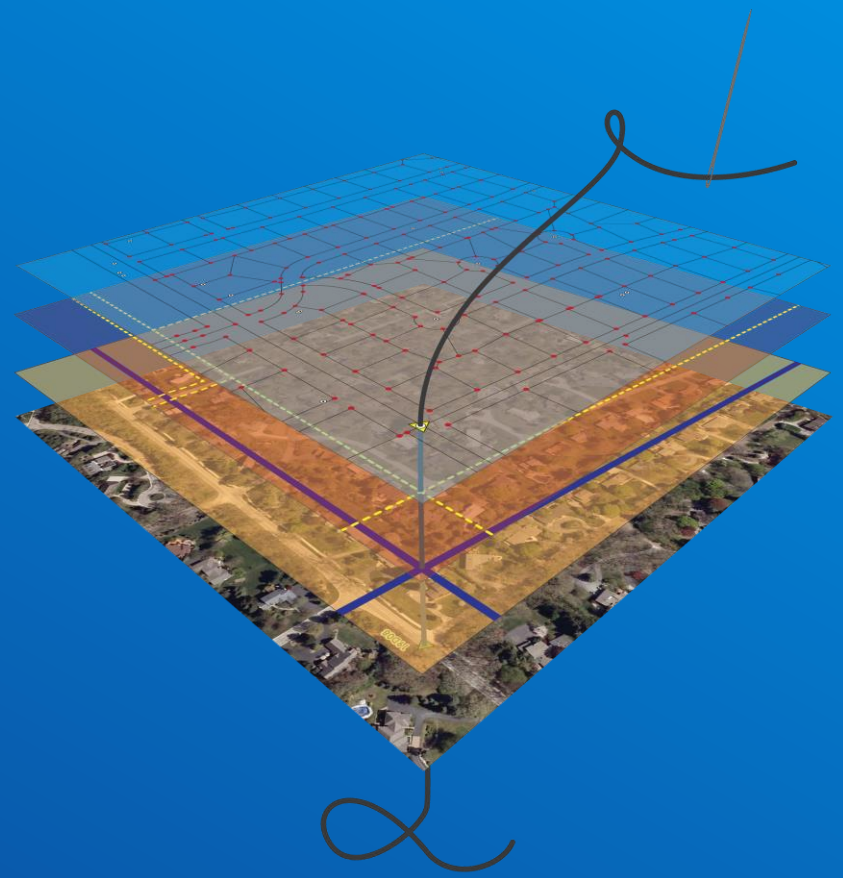
Parcel Fabric

- Parcel editing in ArcGIS Pro: record driven and quality driven workflows
- Parcel quality evaluation
- History of parcels
- Dual depiction of the legal and physical world
- Associate cadastral features to their legal source
- Record features are the footprint of the legal transactions
- Land descriptions: metes and bounds, area description, natural features, coordinate based
- Robust & scalable

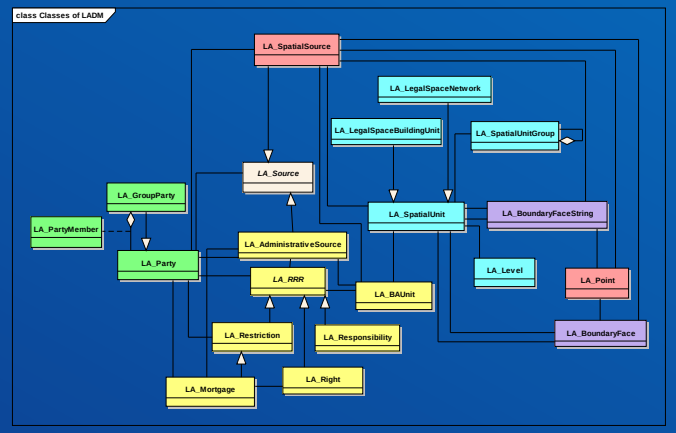


Parcel Fabric characteristics

- Designed for the next 15-20 years
- Supports ‘Record driven workflows’ and ‘Quality driven workflows’
- Meets modern cadastral requirements: 2.5D, coordinate based, lineage, digital submission…
- Works “anywhere": Any client, any cadastral system / land description
- Easy to adopt and fast to deploy
- Efficient, scalable, configurable
- Geo-enables business systems

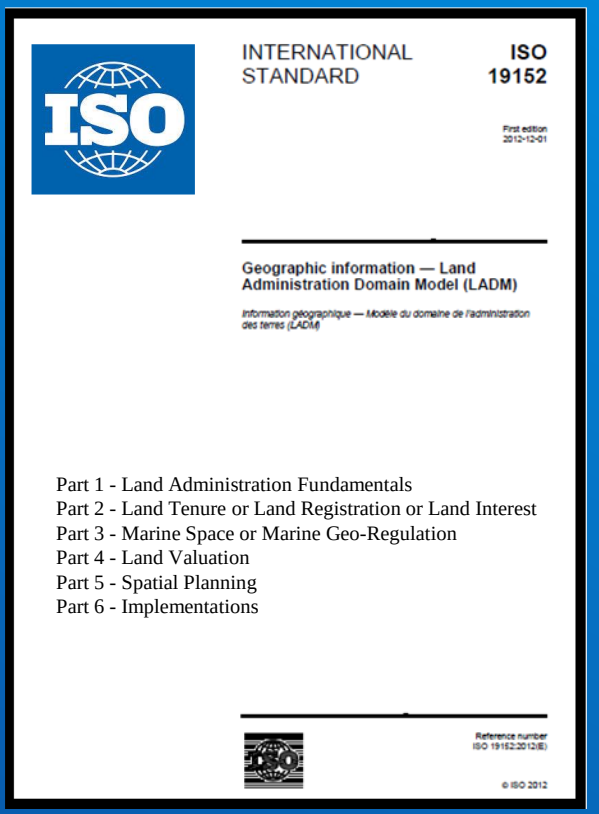


Parcel Fabric: LADM integration

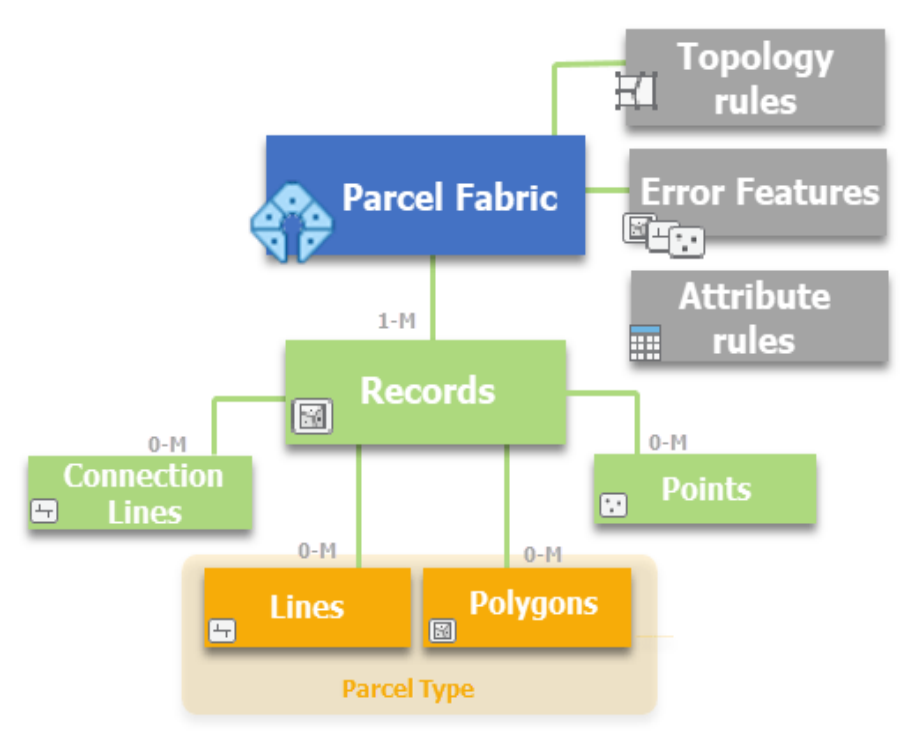


Country profiles

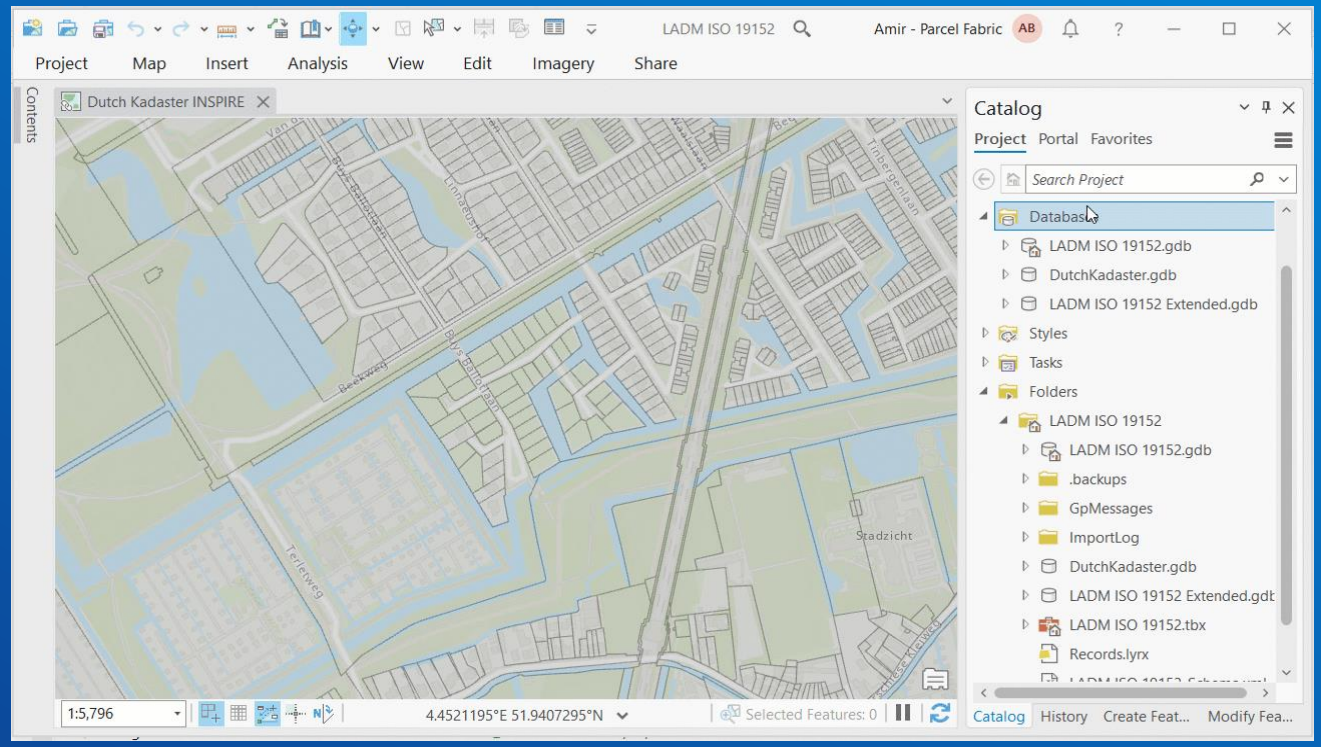
Albania	Israel	Russian federation
Bénin	Japan	Saudi Arabia
Brazil	Kenya	Scotland
Cape Verde	Malaysia	Serbia
China	Mongolia	Singapore
Colombia	Montenegro	South Africa
Croatia	Morocco	South Korea
Cyprus	Mozambique	The Netherlands
Czech Republic	Nigeria	Trinidad and Tobago
Ethiopia	Nicaragua	Turkey
Greece	Poland	Uganda
Honduras	Portugal	Victoria, Australia
Hungary	Queensland, Australia	Vietnam
Indonesia	Republic of Srpska	



LADM in Parcel Fabric

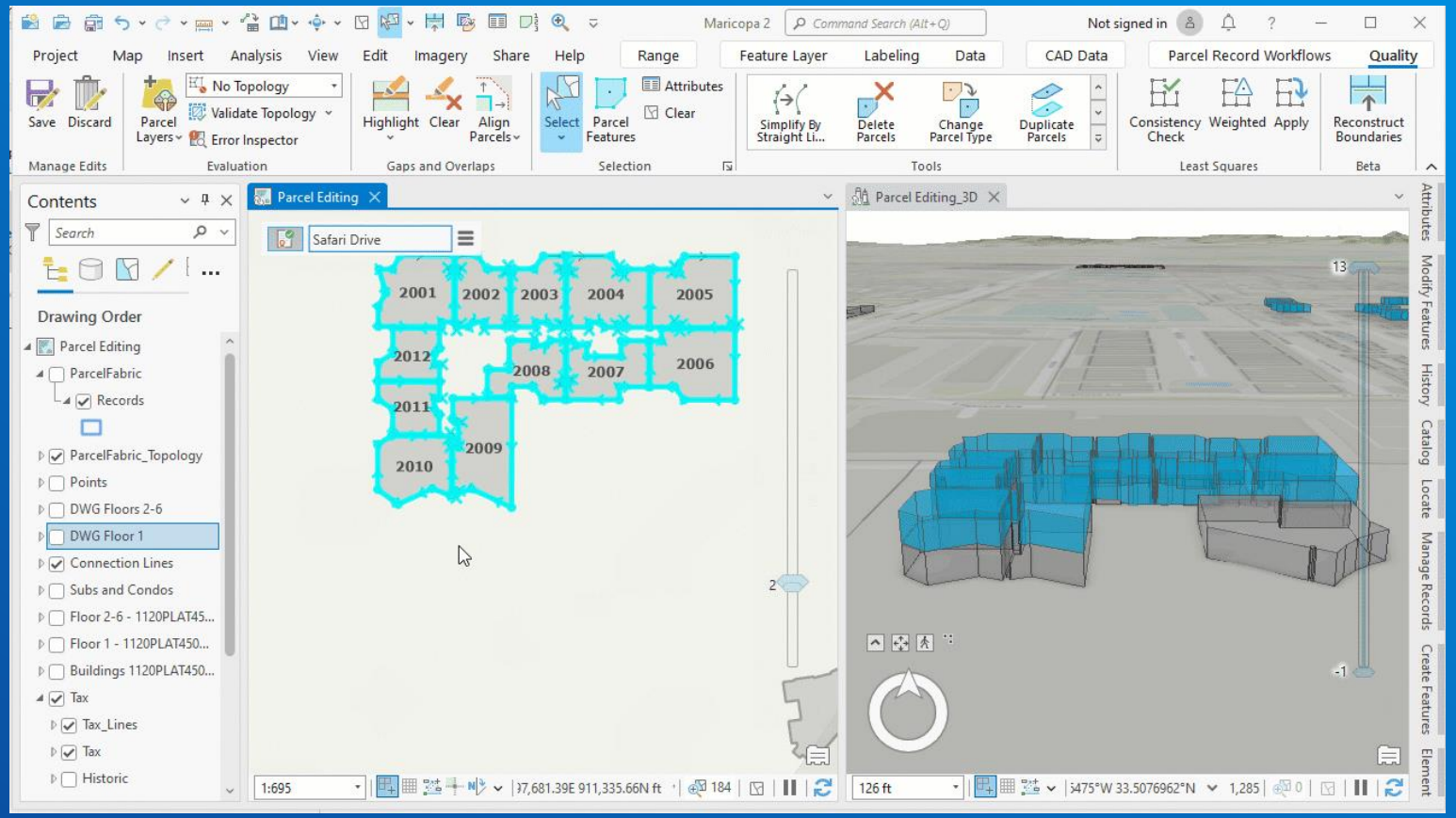


Simple data model, rule driven



3D?

- Parcel Fabric also support strata parcels and has dedicated capabilities to maintain them
- 2D data is easier to maintain and can be displayed in 3D



Parcel Management using Parcel Fabric

- LADM
- Branch versioning
- Web based
- Offline
- SaaS
- Strata Parcels
- Parcel Lineage Depiction
- Title Map
- Least Square Adjustments
- Web Apps

Near-term

- Parcel Fabric Online Deployment
- Traverse from Deed
- Align Parcels Enhancements
  - Support connection lines
  - Align to features outside of parcel fabric

Mid-term

- 3D Cadastre
  - Support irregular 3D parcel geometry using 3D Objects
- Mobile workflows - coordinate based cadastre

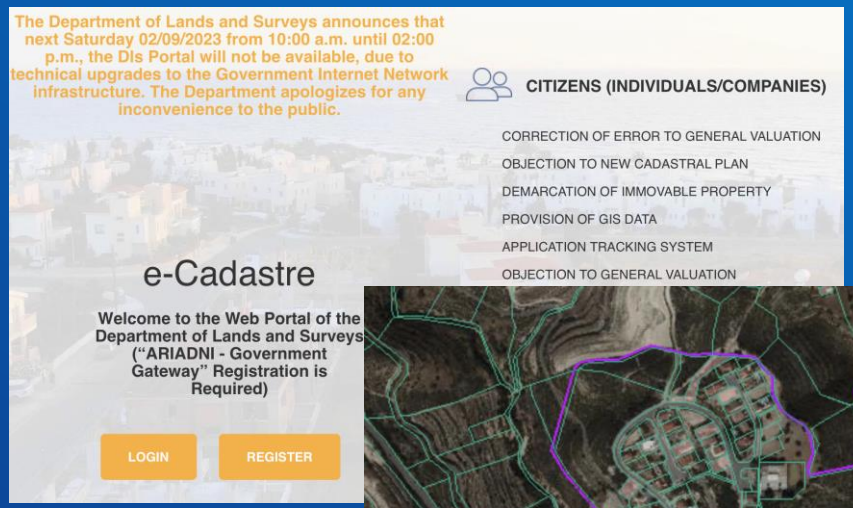
Long-term / R & D

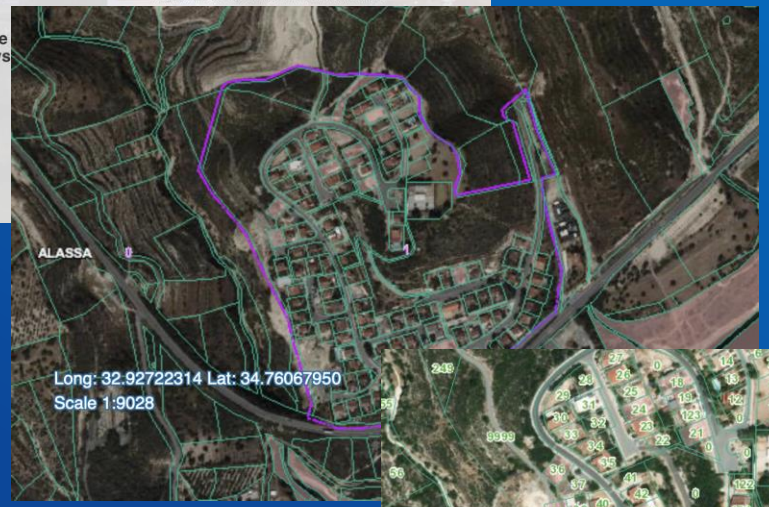
- Parcel Web Editing & widgets
- Parcel Lineage
  - Load Historic Parcels
  - Fix Lineage
- AI & ML for parcels
  - Read and Interpret scanned plats

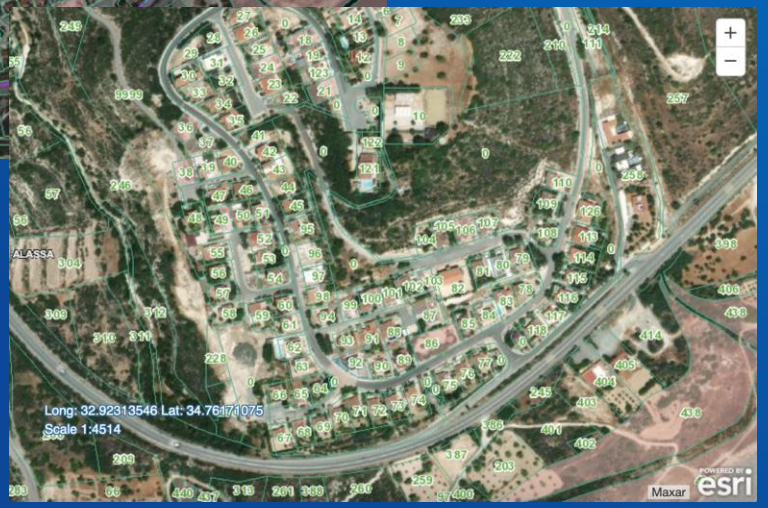
REPUBLIC OF CYPRUS | MINISTRY OF INTERIOR
DEPARTMENT OF LANDS AND SURVEYS

Cyprus: Dept of Lands and Survey

Modernization of National Computerized LIS







DEPARTMENT OF LANDS AND SURVEYS

"The wealth of data in the Department is enormous and is considered as the most important strategic asset of the Department of Lands and Surveys.

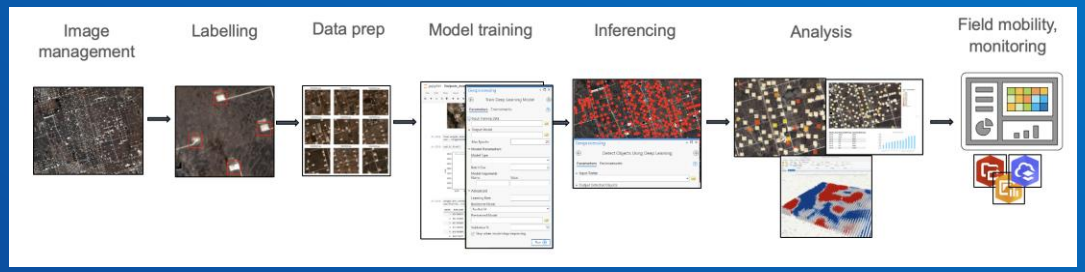
CLIS

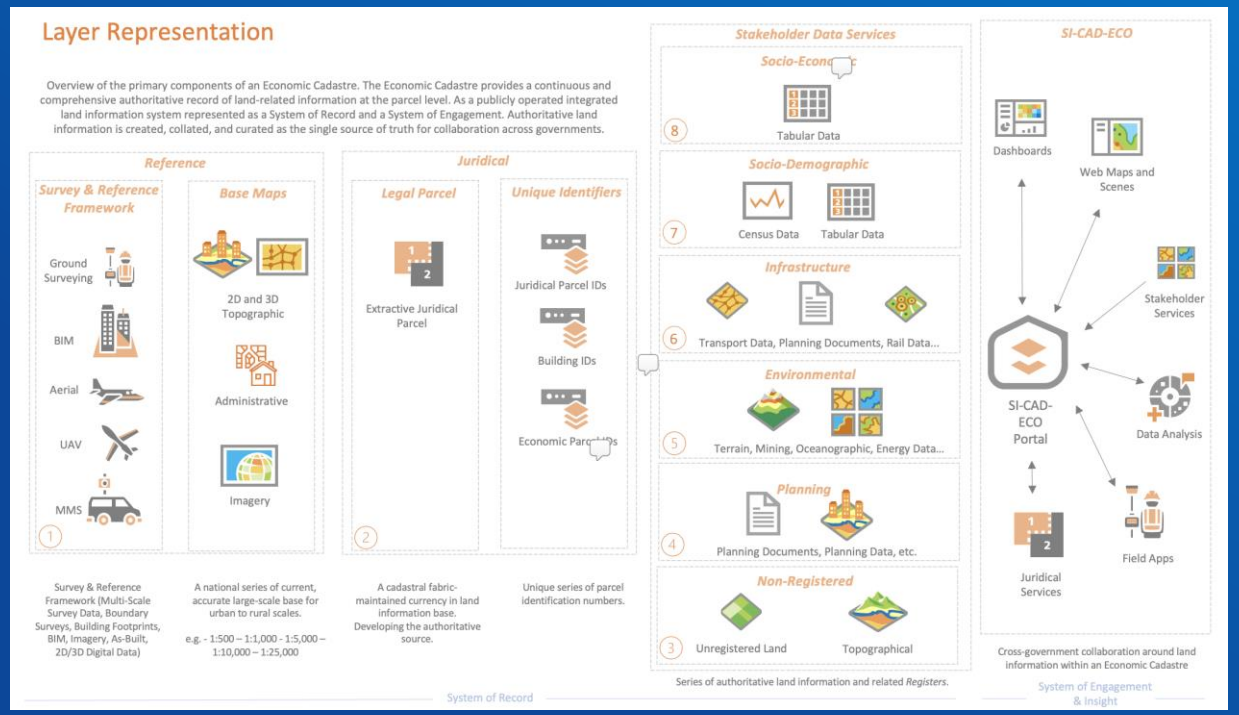
- Digital Transformation of 20+ year old platform
- Services Based Architecture
- First national level deployment of the Parcel Fabric.
- Workflows for Customer Transactions
- Dashboards and Reporting
- Integration into legacy Legal & Fiscal System

esri

ANCFCC, Morocco

Design of the National Economic Cadastre



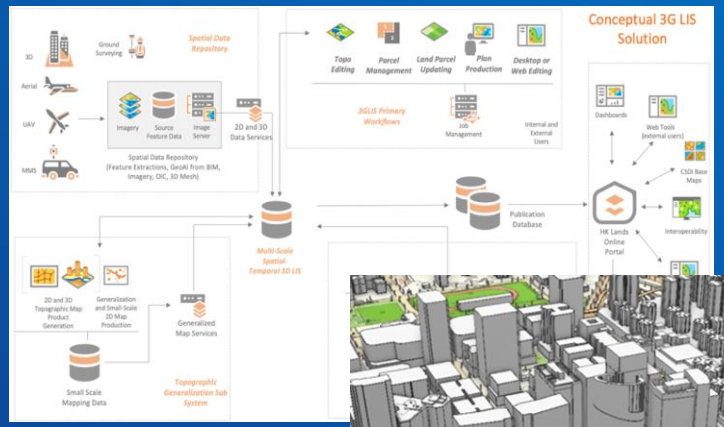


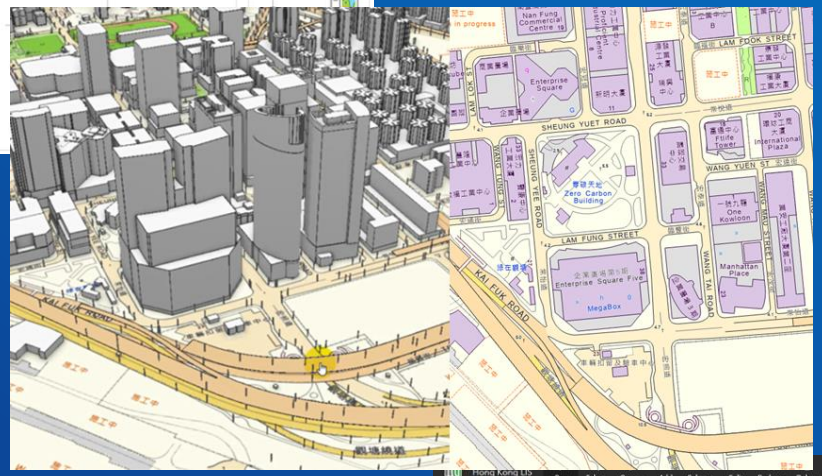
SI-CAD-ECO

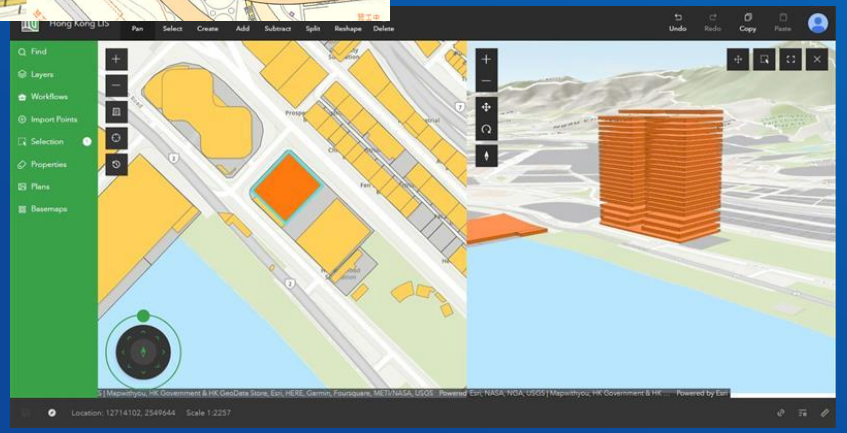
- Design of a National Economic (Multipurpose) Cadastre
- Could First Architecture
- Development of GeoAI Workflows for Feature Extraction
- Supporting the Morocco SDI
- Implementation of the Parcel Fabric at the National Level

Lands Department, Hong Kong

3rd Generation Land Information System







3GLIS

- Digital Transformation – 2D to 3D System of Record
- National Objectives
  - Smart Hong Kong
  - Development of a Digital Twin
- Design Principles
  - Cloud First Architecture
  - Web Editing
  - Full 3D System of record
  - Nex Generation Workflow Management
  - Portal and Apps
  - Serving the CSDI

Conclusions

- GIS can be used in the design and development of a cadastral system to make it scalable and sustainable
- GIS provides the platform where available data sources can be consulted and Fit for Purpose analysis, data management, and data sharing can be done
- LADM data model can be applied within Parcel Fabric
- There is a growing interest in 3D cadasters, Artificial Intelligence and Machine Learning technologies

Thank you!

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