



# Modern Technology for Land Administration *Enterprise Cadastre Systems*

Brent Jones PE, PLS

Esri

**THE  
SCIENCE  
OF  
WHERE**

# Esri Community



*Our Global Community*

**1,100** National Government Agencies

**2,200** States & Regional Agencies

**20,000** Cities & Local Governments

**30,000+** Businesses

**3,300** Utilities

**5,000** NGO's

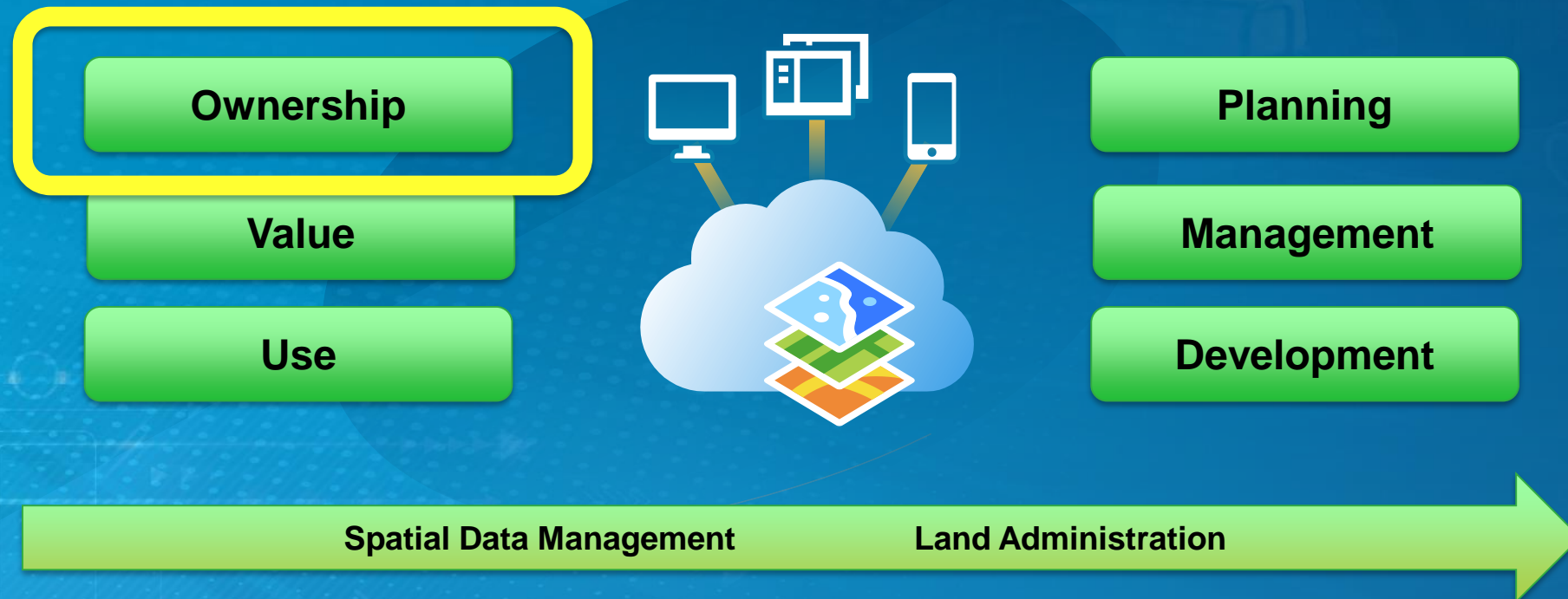
**7,000** Colleges & Universities

# Land Administration

ArcGIS is the Platform for Land Administration

Land administration is the process of determining, recording, and disseminating of information about ownership, value and use of land when implementing land management policies.

Source: UN/ECE Land Administration Guidelines 1996

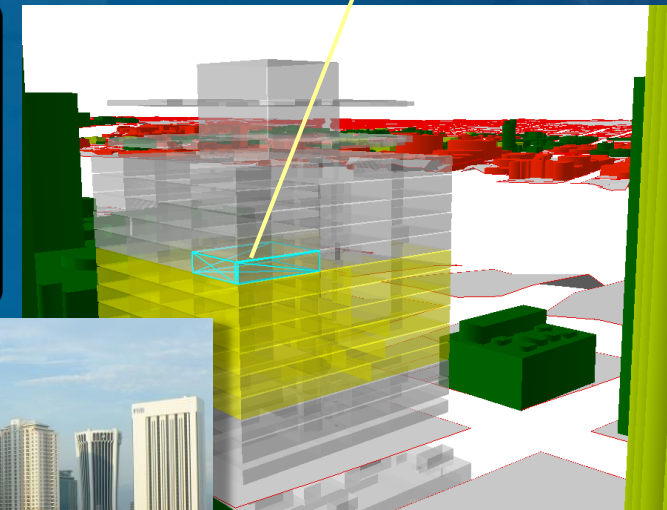
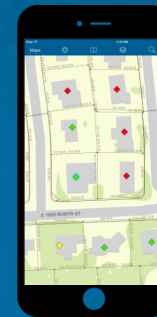


*ArcGIS enables good land administration.....*

# Trends

- Engaged citizens
- Multipurpose
- Transparent/Accountable
- Online Data
- 3D/4D Applications – ownership/value
- Lightweight apps and devices
- Community driven cadastral mapping
- Fully connected data workers
- Growing security concerns

ArcGIS is the Technology Platform



*Powering Cadastral Systems Worldwide.....*

# Trends

ArcGIS is the Technology Platform

- COTS – Commercial Off-the-Shelf Applications
- Cloud infrastructure
- Cadastre is the basis of NSDI
- Faster data updating
- Ongoing data quality improvement
- Faster implementations
- Sharing data
- Funding



*Sustainable, evolvable, scalable.....*

# Good Land Administration

## Benefits

- Secure Tenure
- Equitable Land and Property Taxation
- Support for Government Functions
- Manage Land Disputes
- Protect State Lands
- Poverty Alleviation
- Support for Land Markets
- Improved Land Planning

### Red tape leads to property disputes

**HÀ NỘI**—Bungled legal documents and errors from incapable authorities account for 70 per cent of land-related complaints and denunciations nationwide, according to members of the National Assembly (NA) Standing Committee.

Nguyễn Sinh Hùng, chairman of NA said yesterday that it's imperative to limit the causes of land-related disputes or complaints as they directly affect society and people's daily lives.

He said the responsibilities of relevant authorities at any level should be clearly defined.

Statistics from the Government Inspectorate showed, about

THE WALL STREET JOURNAL  
WORLD NEWS

### China Tackles Land Grabs, Key Source of Rural Anger

By Esteva Fene and Tom Olick

The Chinese government is moving ahead with legislation to combat land seizures from the nation's 800 million farmers, a move that could ease a major source of social unrest.

In a little-noticed move, a meeting of China's State Council, the top government decision-making body, last week backed an amendment to the land-management law. Details remain sketchy, and the law is still to be approved by China's National People's Congress. But experts say that

Government revenue from land transfers in China, in billions of yuan

2011: 3,150

Soil for Sale

Higher costs for acquiring land will force local governments to curb their reliance on infrastructure and housing investment for growth. With trend investment growth already slowing, this move suggests central policy makers are indeed serious about rebalancing, writes research firm Gavekal Dragons in a note.

The costs will be borne by local governments, which will see revenues from land sales fall as compensation costs rise. "This drew attention to local govern-

Left in the dark

### Where flawed addresses expose property owners to foreclosure threat

The Washington Post went on a quest to determine D.C. property owners this summer using mailing addresses in tax office records. The map shows properties with mailings returned as undeliverable because the address on file for the owner was outdated or incorrect.

District tax officials say they use bills and mailings, as well as sewerage ads, to sufficiently warn delinquent owners that a tax lien on their property is for auction and that foreclosure could follow.

Officials say they are working to improve their mailing addresses for property owners.

Flawed owner addresses in 2013 tax lien auction

- Residential
- Commercial and other
- Vacant
- Sold at the auction

4 Editorial Reading

### Land disputes need logical answers

영토분쟁은 논리적인 해답이 필요하다

The escalating tension between Asia's two largest economies—territorial disputes have reached an alarming level and is raising concerns about public safety, regional security and the global economy. 영토 분쟁을 둘러싼 아시아의 두 경제 대국 사이에 긴장이 위험 수위에 도달하면서 지역의 지정안보, 세계경제에 관한 우려를 낳고 있다. The biggest-ever anti-Japan demonstrations erupted

Korea JoongAng Daily 사실 공여 읽기

Sept 18, 2012

다음 단락을 읽기 위하여 논리적으로 결어 읽고 문단 전체를 논리적으로 재구성하여 읽어보기

two countries may be locked into a physical clash on the sea. /민와 일본이 자신의 군사력으로 경쟁을 할 때면 두 나라의 그 해에서 물리의 충돌을 할 수도 있다

Some nationalists in China are stoiking anti-Japanese sentiment to revenge for Japan's war brutalities even though China is now ahead economically. /중국의 일부 애국자들은

50 Community Mirror

Monday, May 6, 2013 www.action360news.com

### Fulani herdsmen, farmers clash over farm lands

**KNE OLATAN**  
BAMBA

The three East African countries are troubled in border of uninhabited (lets) sensitive areas from Japan 동아시아의 주요 3국인 인도네시아는 무인도의 적대적인 논쟁이 벌어져 있는 제국주의의 관념이 대립

A major crisis may erupt between Fulani herdsmen and farmers in Igbalaland, Ido Local Government Area of Oyo State following the incessant destruction of farmlands by cattle.

Farmers in the community comprising Olopadu, Onifuthu, Oluhinbe, Abo Kemo, Elerepa, Oko, Elere Ado, Agun, Elere Akiko and several others, allege that the herdsmen have been herding them, while the police have remained indifferent.

The farmers led by their traditional rulers including Alhaji Bafu Olatun, Chairman of Igbala Development Association; Sheriff Aderibigbe, Baale of Dayu village; Billiamim Akintunde, Baale of Olopadu village; Alhaji Tajudeen Fakunle, Baale of Fakunle village; Opedisi Ayoola, Baale of Abo Ayo village; Sefu Asa, Baale of Batake village; Opedisi Ladipo, Baale of Ido Ayo village; Bamol Adokunle, Baale of Elere Akiko village; Jamis Akintunde, Baale of Abo Kemo village; Jimoh Sami, Baale of Onikang village and Olatunle

Bamkole, Baale of Onifuthu village, protested at the council headquarters.

They were at the council headquarters for a meeting with the 'Fulani-Bororo and Farmers Peace Committee' and the Divisional Police Officer, DPO, in charge of the De-Ido police station where they disclosed that a petition had been forwarded to the state governor, Senator Abiodun Ajimobi and all relevant security agencies.

In the petition, the farmers appealed to the government to wade into the matter to avert a crisis that could likely fol-

low the activities of the Fulani herdsmen, who seem to have the backing of the Criminal Investigative Department, Zone XI, Olopadu.

Titled, "Petition on imminent break down of law and order against the Fulani herdsmen at Olopadu Village in Ido Local Government Area of Oyo State", written by their counsel, Rt. O Muraina from Mushin Abulnabi and Co, the farmers maintained that their farm-lands have been the object of waste destruction caused by grazing by cattle.

They lamented that the re-

spouse each time they reported cases of destruction of their farmlands at the Ido police station, they were told to produce the Fulani who cattle destroyed their farm, and so in January they caught three cows belonging to one Adams Gafar after the destruction of the farm of one Sulaiman Olopadu.

The farmers however, expressed surprise that while the matter was before the Oyo Adju Chief Magistrate Court, the Sarkin Fulani of Eruta, whom the police gave custody of the cows and Adams Gafar, who was released on bail, approached the

Necessary precondition for strong economy .....

# Challenges

- Keeping data current
- Duplicated efforts
- Managing different data types and accuracies
- Unable to share information
- Difficult to deploy multi-use
- No common management view
- IT management challenges
- Difficult to generate property statistics
- Very slow
- Maintaining trust and confidence of the public
- ....

## Traditional Approach



# Land Administration Challenges

Common Global Challenges

**Efficiency**

**Improving Customer Satisfaction**

Growth

**CAPACITY**

Changing citizen expectations

**Security**

**Keeping Data Current**

**Access to data**

**transparency**

**Workflow Management**

**Standards**

**Public Access**

Ad hoc mapping

Cost Containment

**IT Resources**

**new devices**

**accountability**

*Similarities across the world.....*



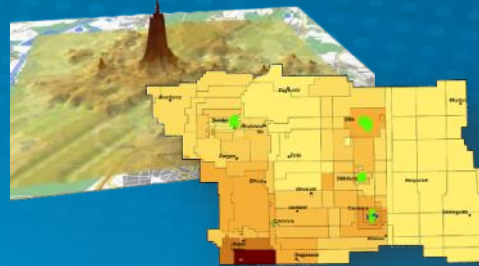
# Land Administration Systems

ArcGIS is the Technology Platform

Digital Cadastre Mapping



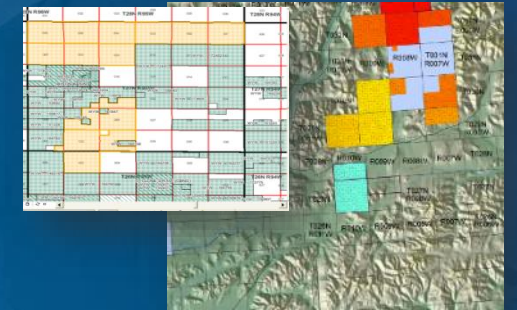
Property Valuation



Transaction Analysis



Integrated Land Management



Field Data Collection



Address Systems



Resource Leases



National Data Portal

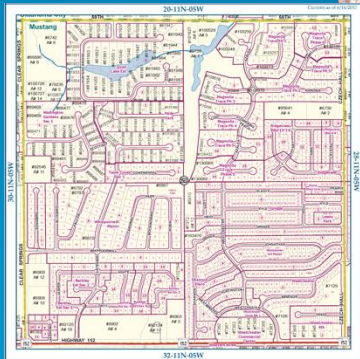


Powering Land Administration Systems Worldwide.....

# Collect, Manage, Analyze and Share Authoritative Land Information

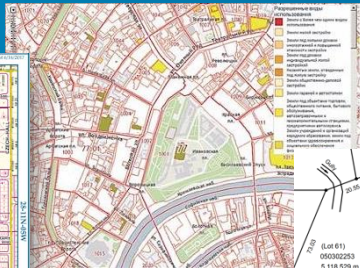
ArcGIS is the platform for land administration systems

Tax Map



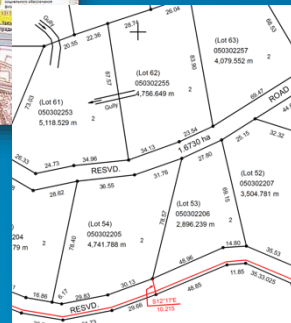
Canadian County, Oklahoma

Land Registration



Russia

Cadastral



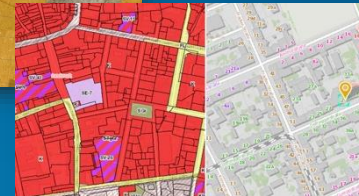
Jamaica  
National Land Agency

Predicting Vacancy



Pennsylvania  
City of Philadelphia

Public Land  
Use Portal



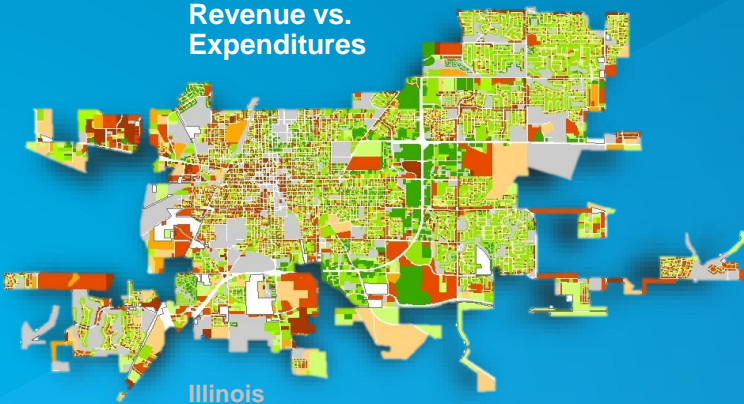
Austria  
SynerGIS

Interagency Collaboration



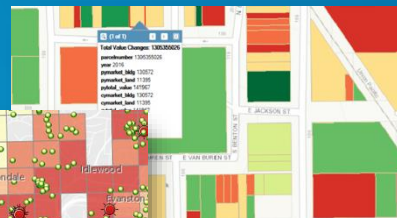
The Netherlands  
Provincie Noord-Holland

Revenue vs.  
Expenditures

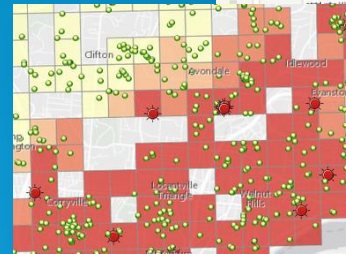


Illinois  
GISRDC

Assessed Value



Tax Appeals



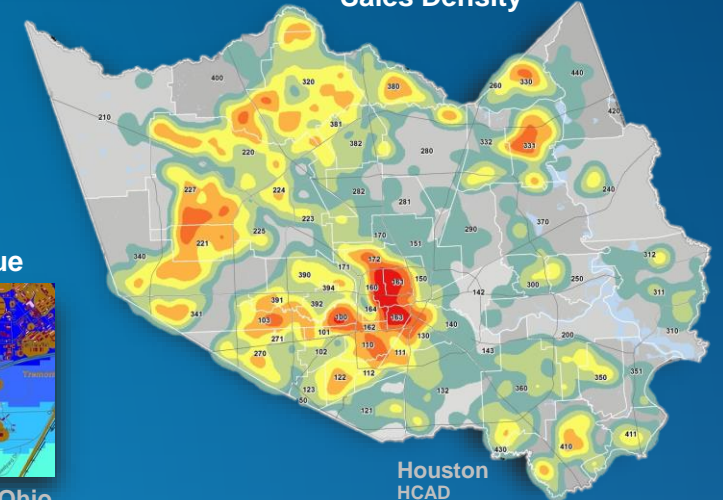
Ohio  
DEVNET Incorporated

Change in  
Property Value



Ohio  
Cleveland State University

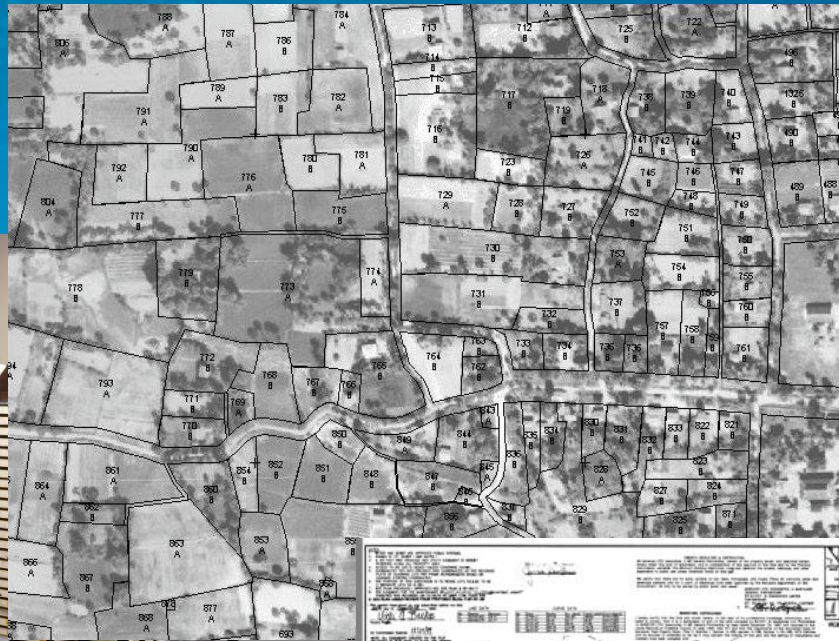
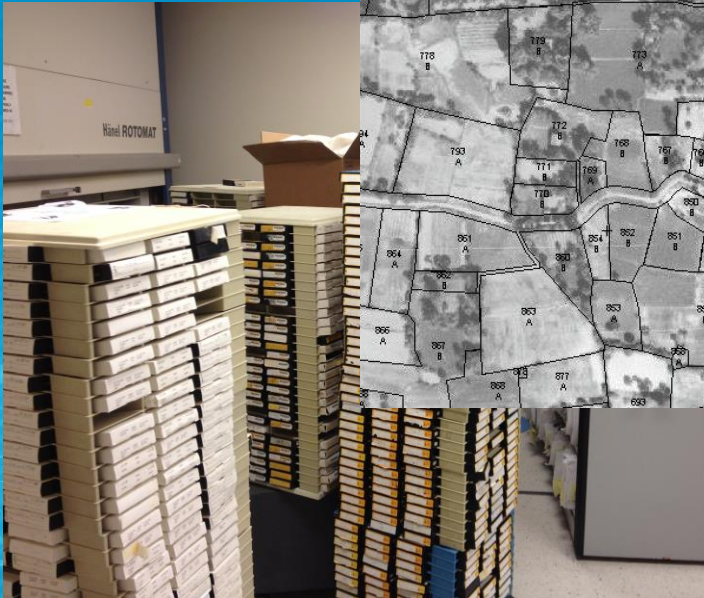
Sales Density



Houston  
HCAD

# System of Record

Organizes and Manages the Legal Record of Ownership, Value and Location



## Cadastral History



Quebec, Canada

## Parcel Query



Auckland, New Zealand

## Cadastre



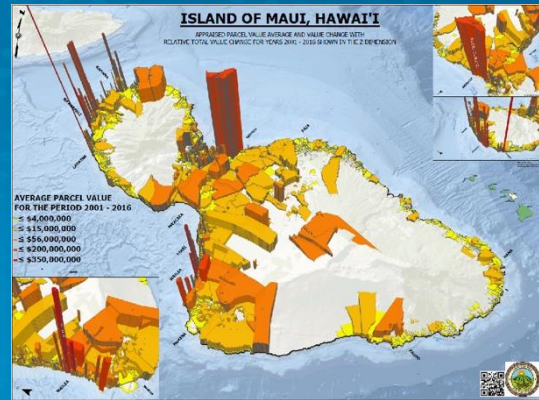
iMap Jamaica



# System of Insight

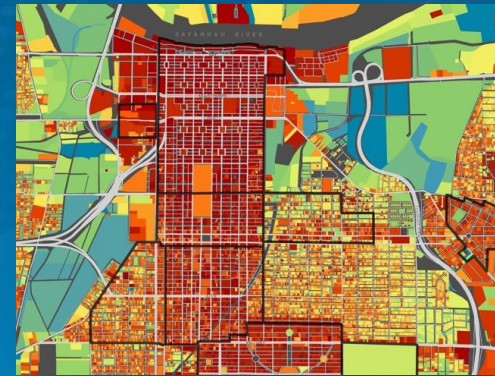
Understand the factors impacting property value and use

## Parcel Values



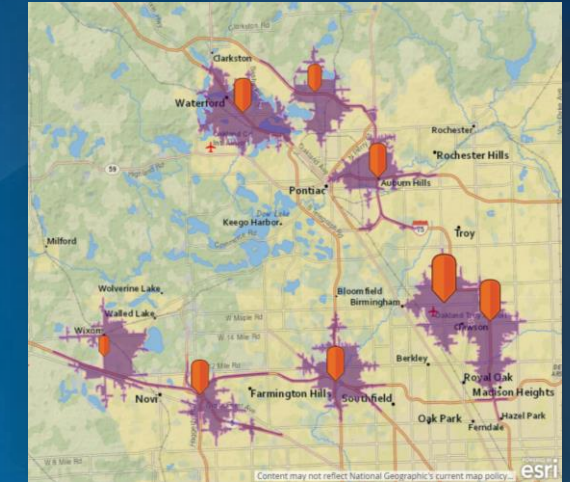
Maui

## Historic District Property Values

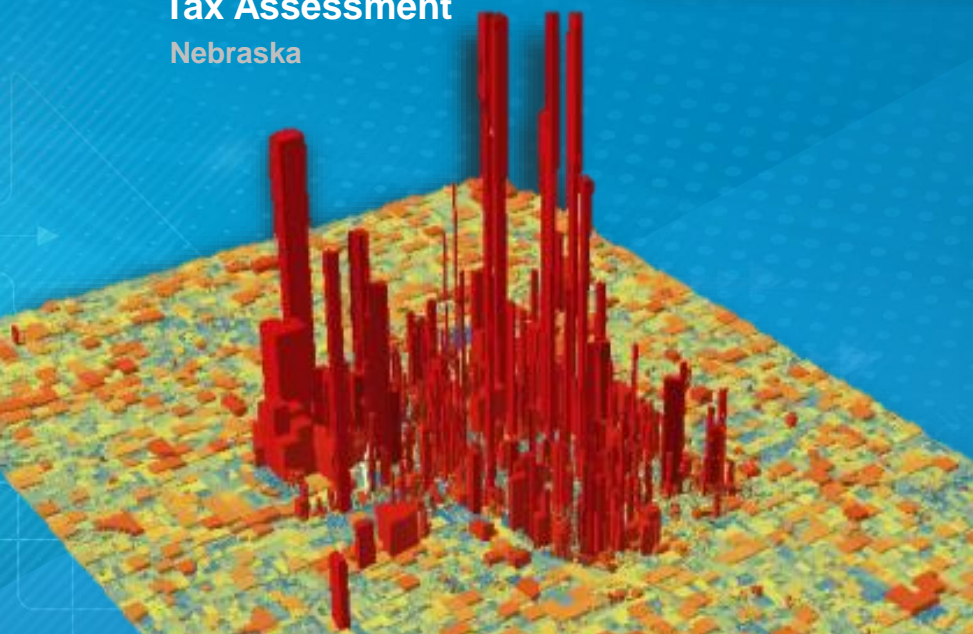


Georgia

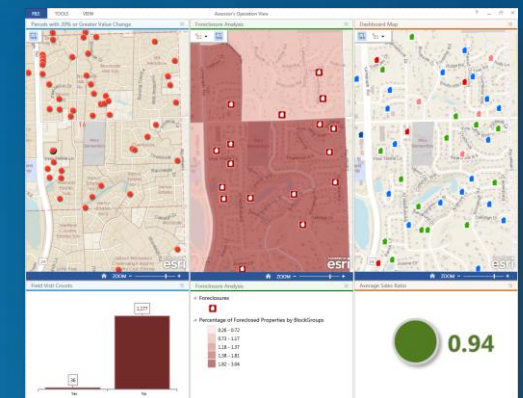
## Trade Market Area Analysis



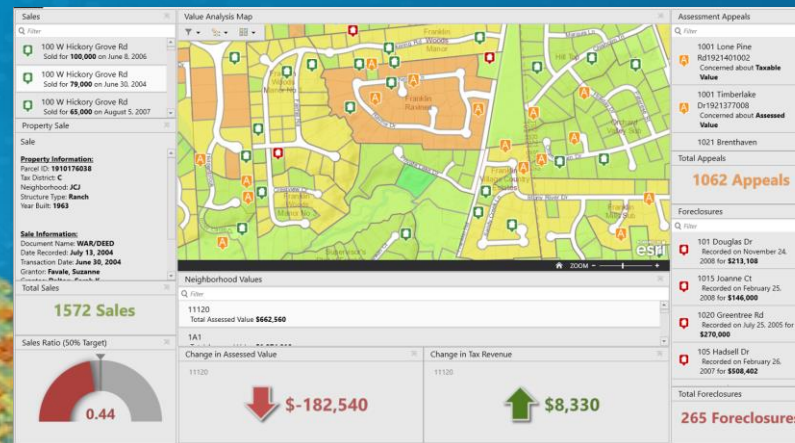
## Tax Assessment Nebraska



## Operations Dashboard



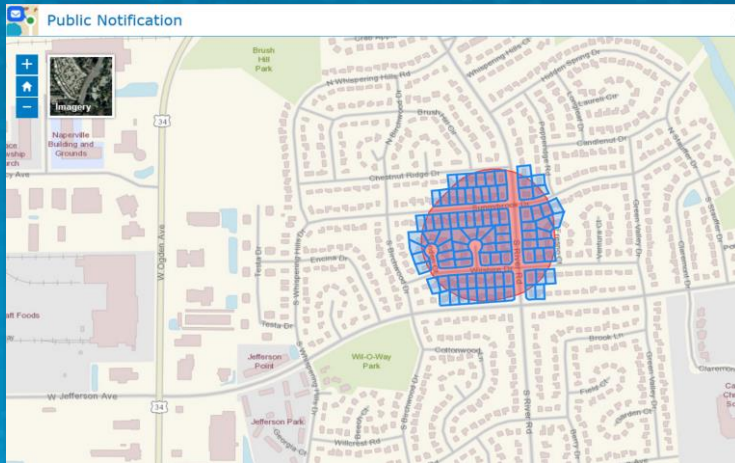
## Value Analysis Dashboard



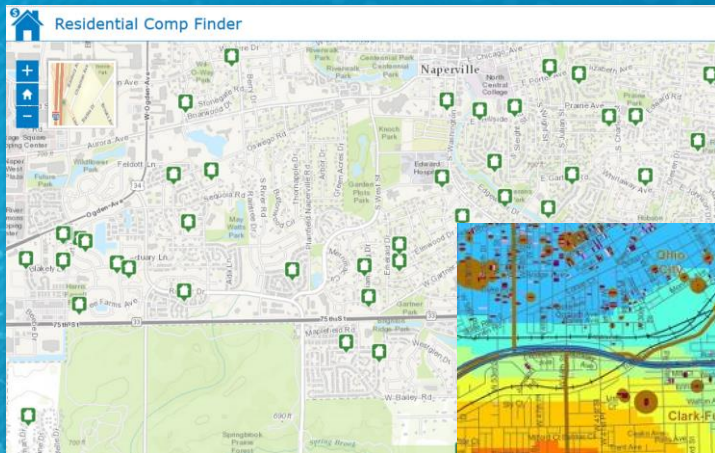
# System of Engagement

## Modern Transparency

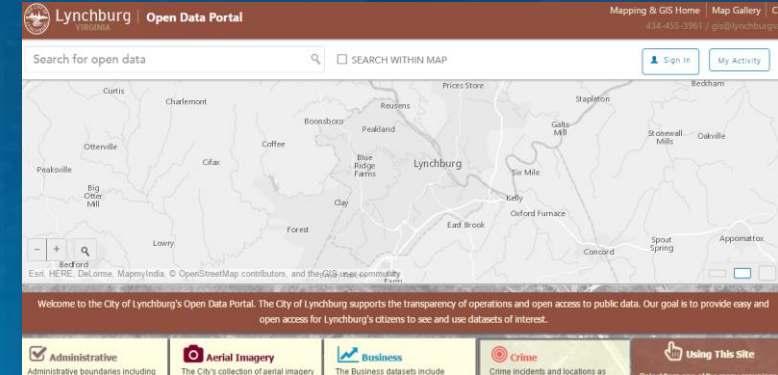
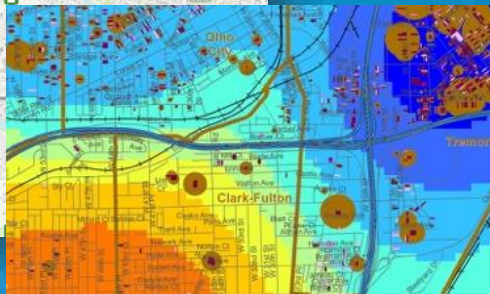
Engaging businesses and citizens with government



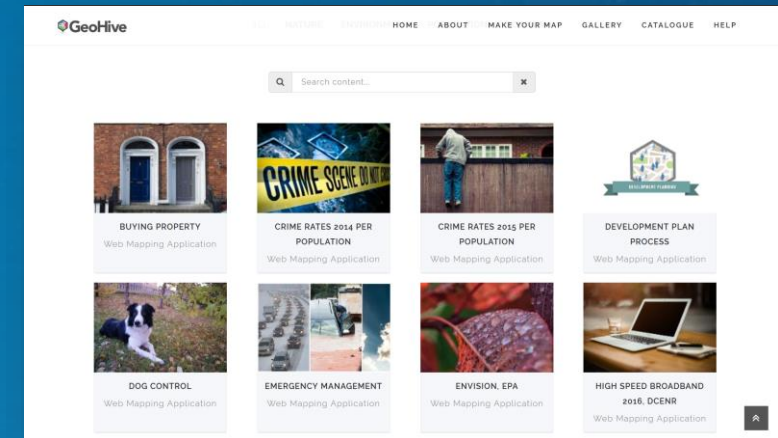
Public Notification



Analytics



Open Data Portals



Initiative Driven Hubs

# GIS Enables Multiple Systems

For Managing, Analyzing, and Applying Geographic Information

Integrating People,  
Processes, Things,  
and Data About Them

System of  
Engagement

Using the Power of Where  
to Integrate Everything

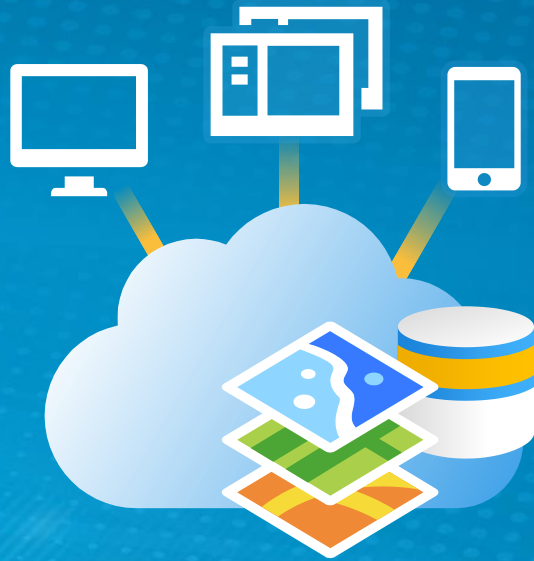
System of  
Record

System of  
Insight



# GIS Is Evolving

Web GIS is the new pattern



## Expanding Your Capabilities

Client / Server	→	Web Services & Apps
Data Models	→	Web Maps & Layers
Custom Applications	→	Configurable Templates & Apps
Static Data	→	Real-Time
Single Server	→	Distributed Computing
Stand-Alone Desktop	→	Connected Desktop
Proprietary Data	→	Open Data & Shared Services
2D Features	→	3D Features
Spatial Analysis	→	Spatiotemporal & Big Data Analytics
Digital Cartography	→	Smart Mapping

# Web GIS Simplifies Working With All Types of Data

Using Web Maps, Scenes, and Layers

Creating  
A Common Language

Apps

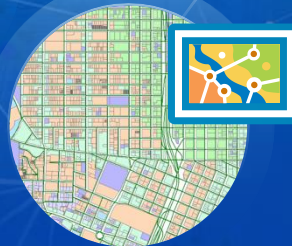
Distributed



Imagery



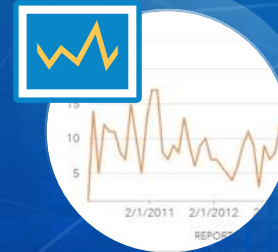
Tabular



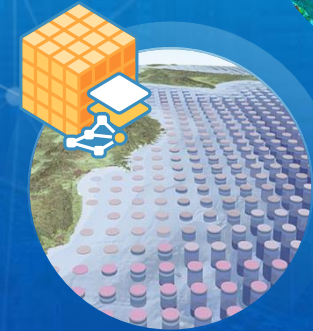
Vector



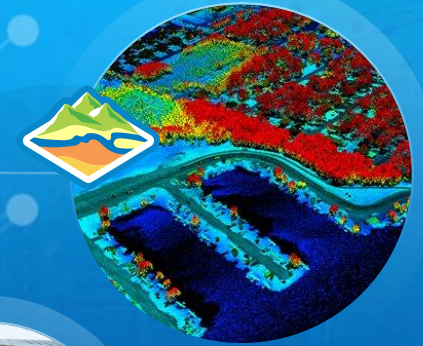
3D



Real-Time  
(IoT)



Big Data



Lidar



# Apps Are Bringing the Power of GIS to Everyone

## Extending the Reach of GIS



*Across Organizations and Beyond*

# ArcGIS Content | A Fundamental Part of the Platform

Thousands of Ready-to-Use Maps  
and Datasets from Esri

## Basemaps Soils

Agriculture Topo Maps Addressing

Ecology Sentinel Earthquakes Traffic Rainfall

Geology Vegetation Roads

## Imagery Land Cover Scientific

Stream Gauges Landsat Species NAIP Planes Lifestyle

Water MODIS Biology Elevation POIs

## Demographics Protected Areas

Distribution

## Hazards Climate DigitalGlobe Floodplains

Weather Historical Maps Landscape Oceans Stream Forecasts

## Population Boundaries OSM

Sea Temperature Wildfires Railroads

Millions of Maps and Layers  
Shared by Users

*The Foremost Collection of Global Geographic Information . . .  
. . . A Living Atlas for the Planet*

# Web GIS Integrates Business Systems & Point Solutions

Data, Information Products, Apps, Models, Systems  
. . . . and People and Their Organizations

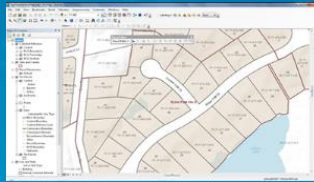


# GIS Solutions

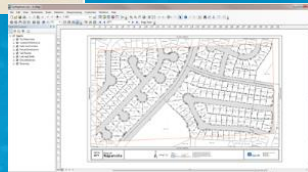
## Supporting Global Cadastre Requirements

### Parcel Management

#### Parcel Editing



#### Quality Control

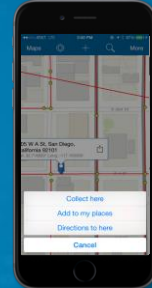


#### Map Production

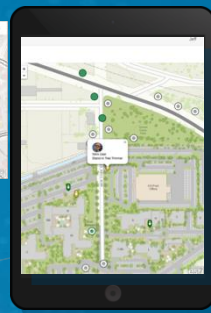
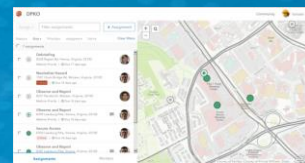


#### Address Management

### Field Operations



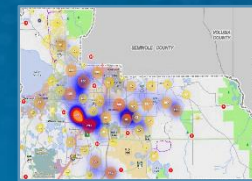
#### Mobile Access to View & Edit



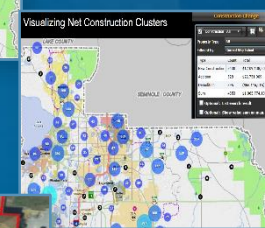
#### Workforce

### Valuation Analysis

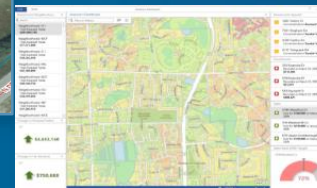
#### Foreclosure Mapping



#### Construction Permit Visualization



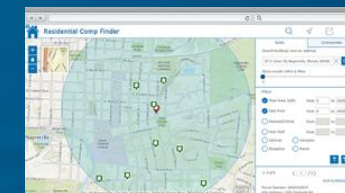
#### Property Appraisal



#### Visualize Property Value



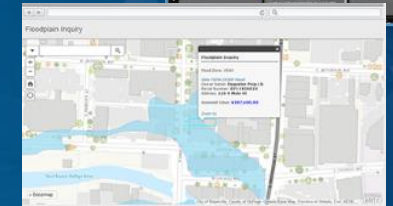
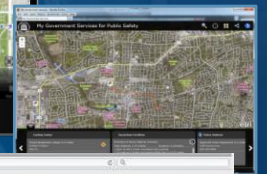
#### CAMA Visualization



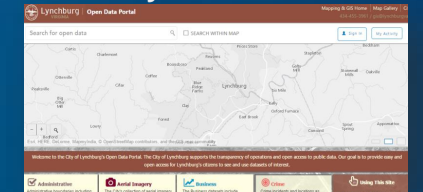
#### Residential Comp Finder

### Public Relations

#### Modern Public Access



#### Identify Flood Risk



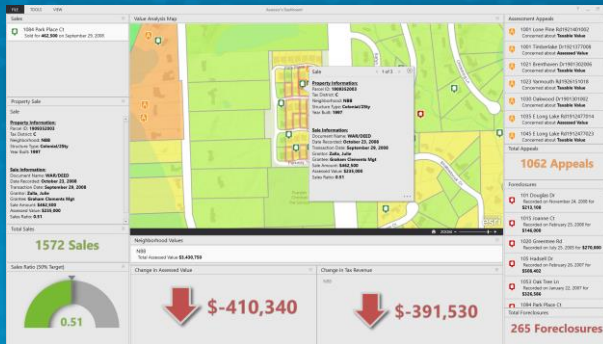
#### Open Data - Hubs

# Field GIS | Taking ArcGIS Beyond the Office



# Value Analysis

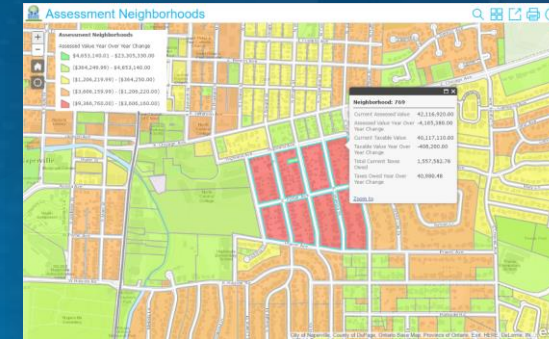
Analysis, Visualization, Maps and Apps



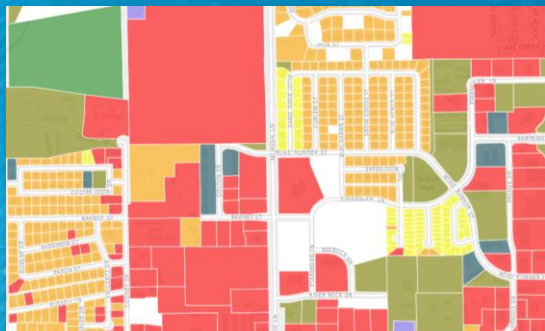
Value Analysis Dashboard



Value Change Over Time



Valuation Neighborhoods



Spatial Analysis



Photo Survey

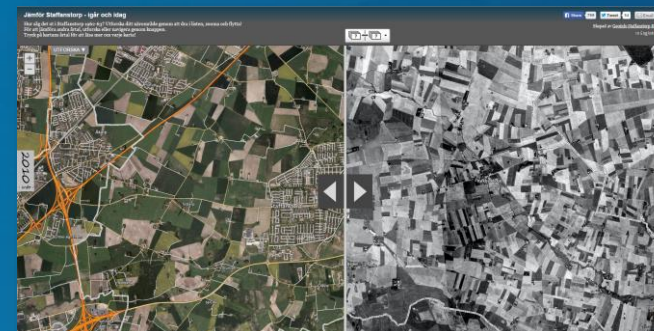


Image Comparison

Discover and visualize trends and patterns.....

# Public Relations - Transparency

Maintain Citizen Trust and Confidence



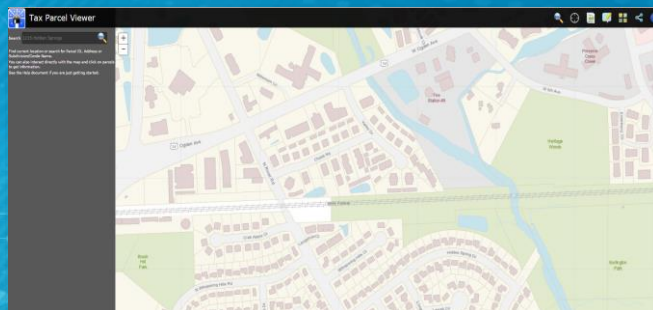
Portals



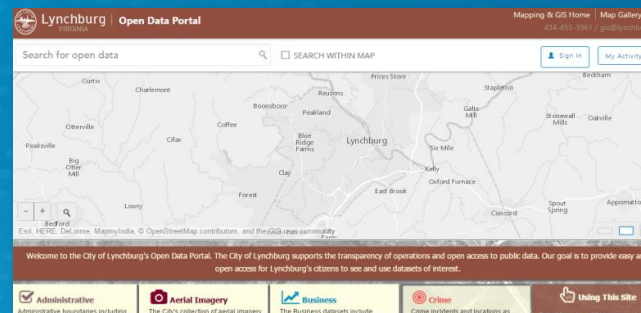
Story Maps



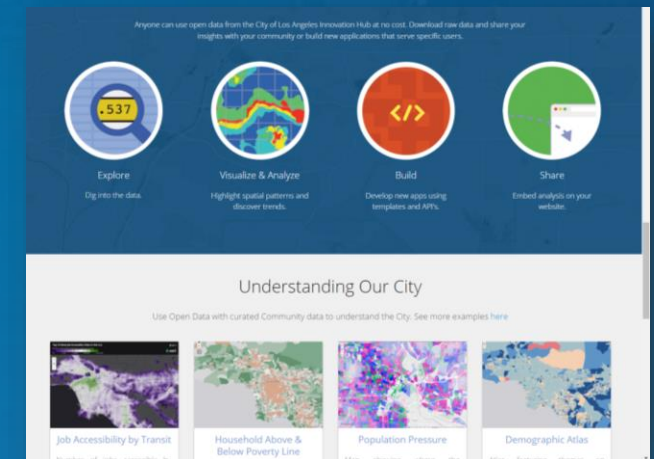
SDIs and Initiative Driven Hubs



Data Viewers



Open Data



*Engage and inform the public and stakeholders....*

# Parcel Data Management

Improved, Efficient Workflows

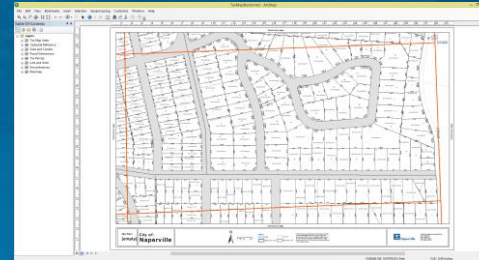
## Deed Examining



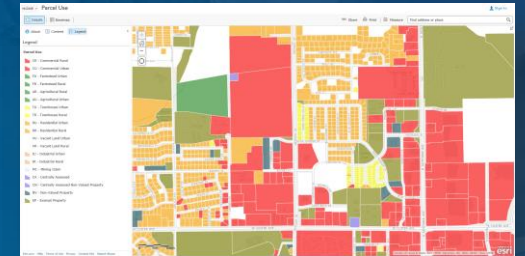
## Workflow Manager



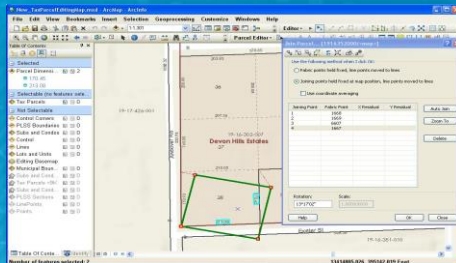
## Tax Map Book



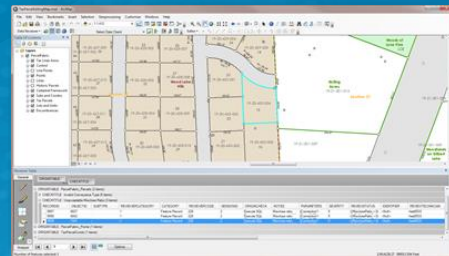
## Community Parcels



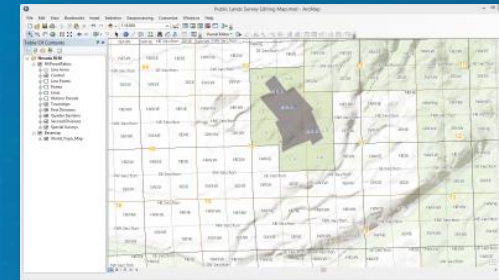
## Parcel Editing Solution



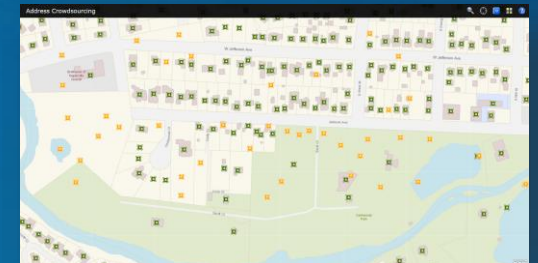
## Data Reviewer for Tax Parcels



## Survey Management



## Addressing



*Collect, Organize and Manage Data in the System of Record.....*

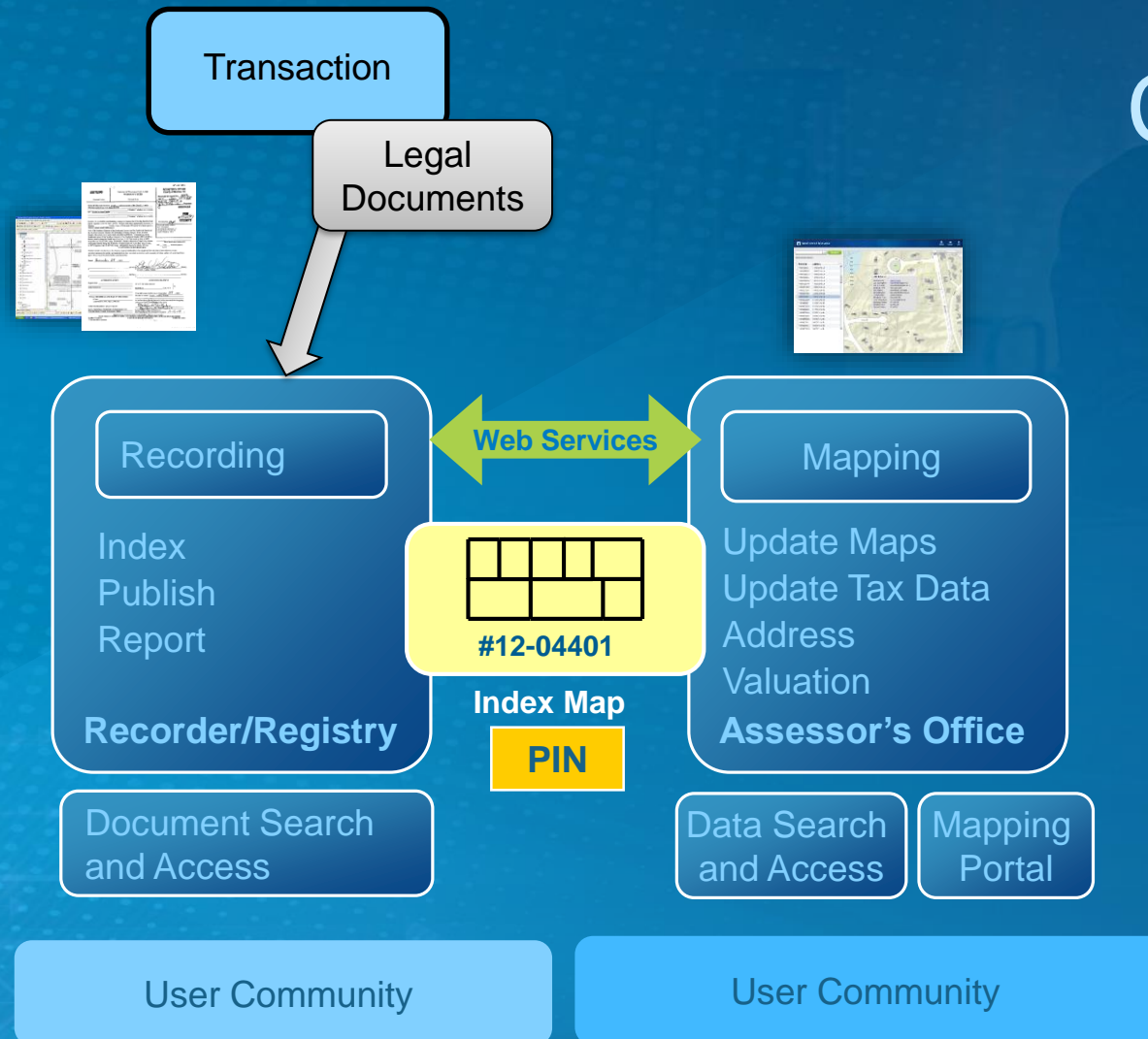


# Integrating Registry & Cadastre

Web GIS integrates Cadastre and Registry

## Registry

## Cadastre



# Purpose-Built Tools

Integrity, Topology, History

Feature  
Adjustment

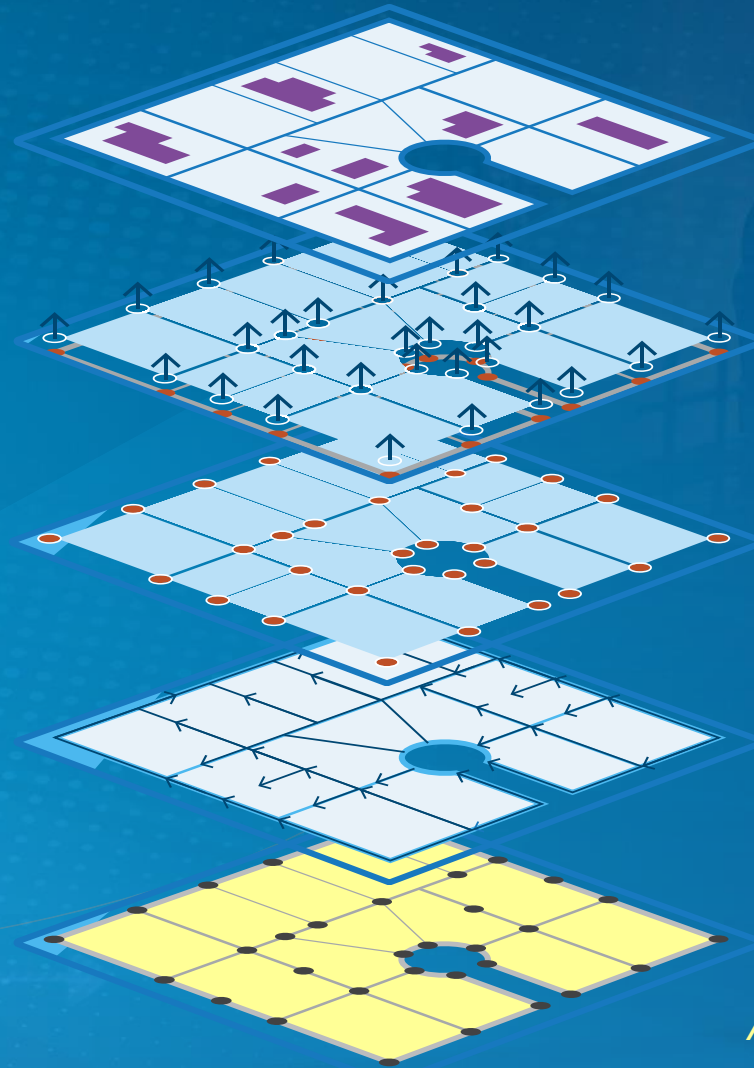
Coordinate  
Updates

Control Points

Least  
Squares  
Adjustment

Measurements

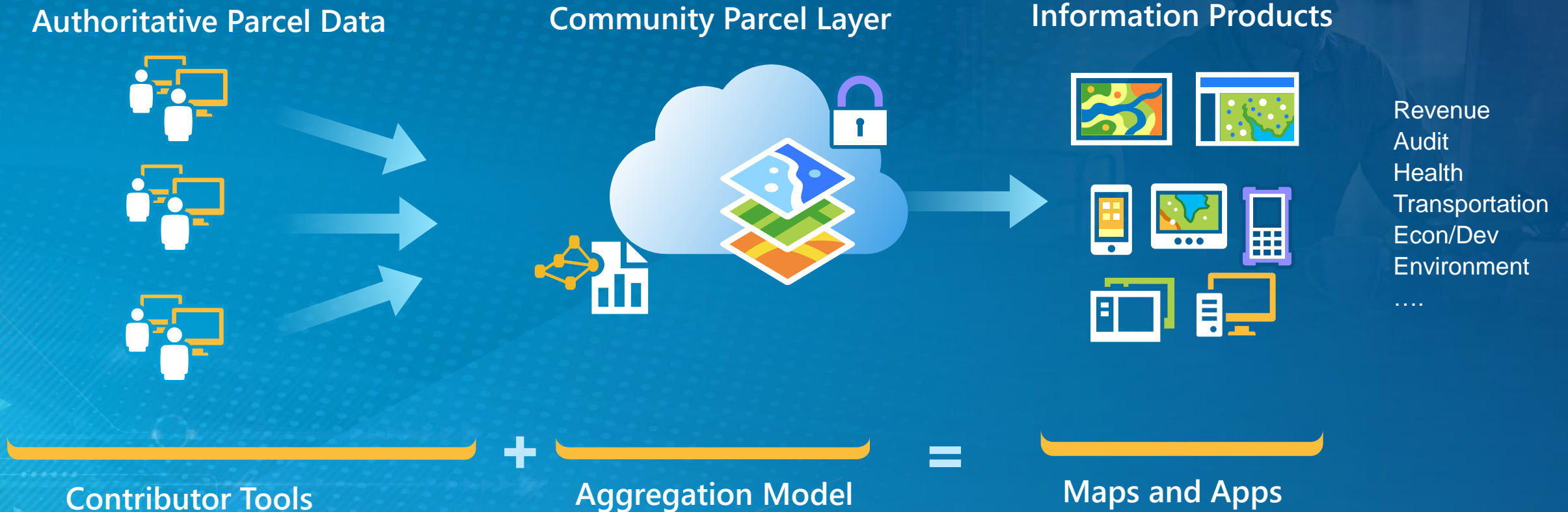
Parcel Fabric



*Aligning Data Using Measurements.....*

# Support for Data Aggregation

Web GIS solution for parcel aggregation



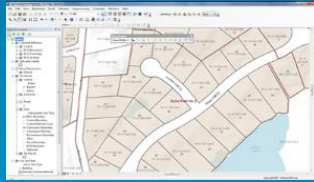
*COTS Tools for aggregating and sharing.....*

# ArcGIS Solutions

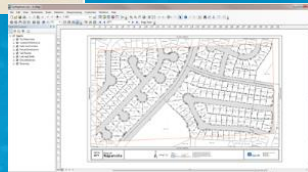
## Supporting Global Cadastre Requirements

### Parcel Management

#### Parcel Editing



#### Quality Control

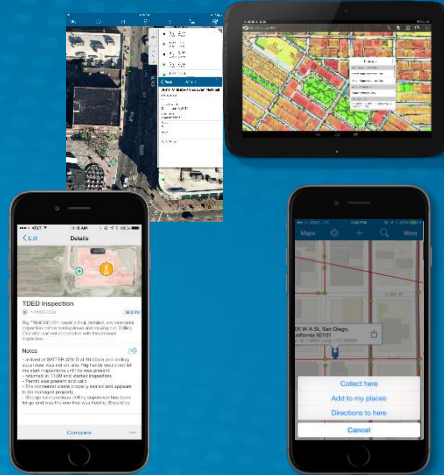


#### Map Production

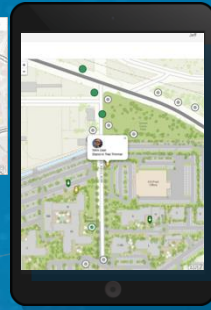
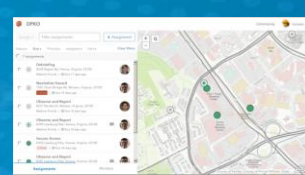


#### Address Management

### Field Operations



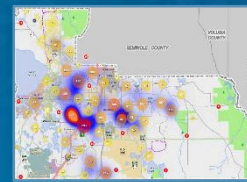
#### Mobile Access to View & Edit



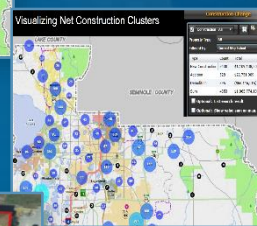
#### Workforce

### Valuation Analysis

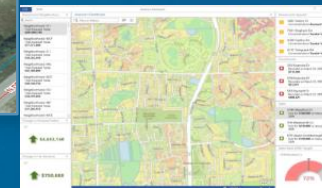
#### Foreclosure Mapping



#### Construction Permit Visualization



#### Property Appraisal



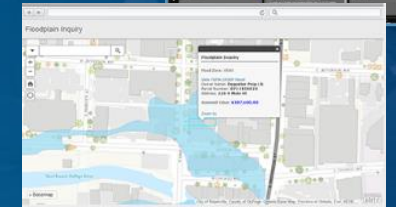
#### Visualize Property Value



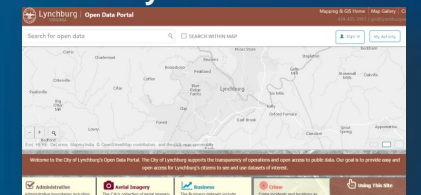
#### CAMA Visualization

### Public Relations

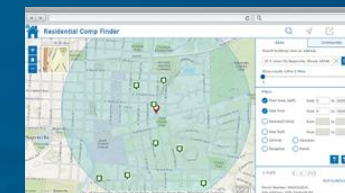
#### Modern Public Access



#### Identify Flood Risk



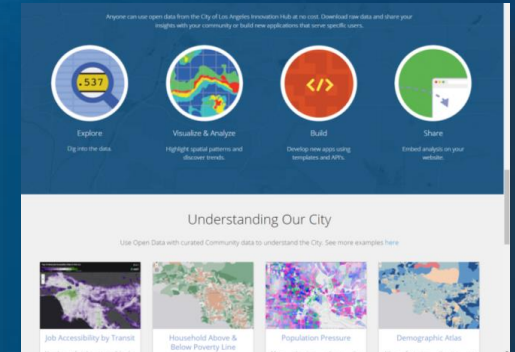
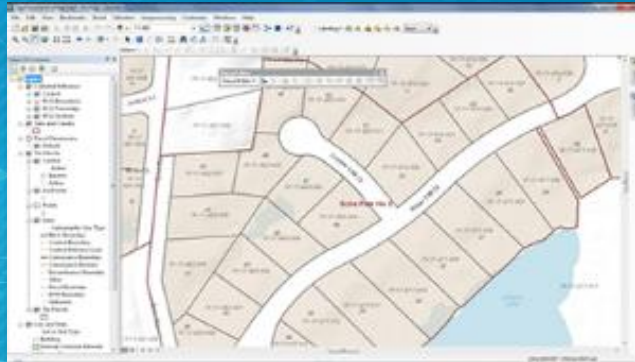
#### Open Data - Hubs



#### Residential Comp Finder

### Modern Enterprise Cadastre

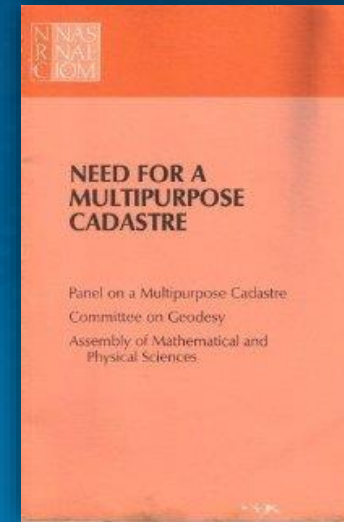
### Workflow Management



# Necessary Components

## Multipurpose Cadastre

1. Survey Reference Frame
2. Current, Accurate Large Scale Maps
3. Cadastral Data/Map
4. Unique Parcel Identifier (PIN) on All Properties
5. Land Data which includes PIN



# Questions

Brent Jones PE, PLS

Esri

Mike Thomson, BCLS

Surveyor General of British Columbia

# Resources

**Connect with an Expert –**

**<http://go.esri.com/getstartedland>**

**Land Records Meetups -**

**<http://go.esri.com/landrecordsmeetup>**

**Land Administration Solutions Page -**

**<http://go.esri.com/landsolutions>**





esri

THE  
SCIENCE  
OF  
WHERE