Smart Land Administration

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<table>
<thead>
<tr>
<th><strong>What is Smart?</strong></th>
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<tbody>
<tr>
<td><strong>Required</strong></td>
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<tr>
<td>• Open</td>
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<tr>
<td>• Secure</td>
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<tr>
<td>• Authoritative</td>
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<tr>
<td>• Sustainable</td>
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<tr>
<td>• Cost Effective</td>
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<tr>
<td>• Reliable</td>
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<tr>
<td>• Scalable</td>
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<tr>
<td><strong>Important</strong></td>
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<tr>
<td>• Contributory</td>
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<td>• Usable</td>
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<tr>
<td>• Timely</td>
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<tr>
<td>• Evolvable</td>
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<td>• Flexible</td>
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<td>• 3D</td>
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<td>• Attainable</td>
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<tr>
<td>• Inclusive</td>
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<tr>
<td><strong>Modern</strong></td>
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<tr>
<td>• APIs</td>
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<td>• Good Cartography</td>
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<tr>
<td>• Single Source</td>
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<tr>
<td>• Delivers Answers</td>
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<tr>
<td>• Individualized</td>
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<tr>
<td>• Easy-to-Use</td>
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<td>• Uber-proof</td>
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What enables Smart?

Standards

Content

Configurable
Evolvable
Standards

Required for systems integration, interoperability and sustainability

Open Standards and Formats

XLSForm  GML  SQL  SLD  SOAP  WMTS  KML  LAS  INSPIRE  Shapefiles
IMDF  WCS  IFC  Web Scene (I3S)  LERC  CSW  WPS  REST  OneGeology
WFS  WMS  OPeNDAP  JSON  WaterML  netCDF  GeoPackage  CityGML

Direct Integration

MS Office  SQL Server  SharePoint  Azure  Power BI  Netezza  SAP HANA
Adobe Creative Cloud  Jupyter Notebook  Teradata  R  AWS  Altibase  Python
Oracle  Hadoop  AutoCAD  Revit  PostgreSQL  Dameng  SQLite

Open Software Architecture

Open Data Access  Open APIs & SDKs  Open-Source Integration
Open-Source Contributions  Extensible Architecture  Embeddable
Standards

Fit-For-Purpose Land Administration

REST

Services

Enabling technology for WebGIS.....
Content

Basemaps
Topo Maps
Earthquakes

Soils
Vegetation
Traffic
Landsat
Traffic

Landsat
Land Cover
Scientific

Elevation
Protected Areas
Floodplains

Demographics
Agriculture
Ecology
Geology

Imagery
Stream Gauges

Water
MODIS

Hazards
Climate
Historical Maps

Weather
Digital Globe

Population
Landscape

Sea Temperature

Distributions
Stream Forecasts
OSM

Wildfires
Railroads

Boundaries
Protected Areas

Promoted Areas

 Millions of Maps and Layers
Shared by GIS Users
Imagery
- NDVI – Sentinel-2
- GEOS-S & Radar

Real-Time Observations
- Drought Monitor
- Wildfire and Wind
- Stream Gauges

Demographics & Geoenrichment
- Income
- Population Change

Basemaps
- Watercolor
- Nova
- OpenStreetMap
- Terrain
- Antique

Living Atlas | World’s Largest Digital Map Library
Curated and Authoritative Source
Configurable/Evolvable
Legal systems of the World
Land Administration

Platform Technology for Land Administration

Ownership
Value
Use

Planning
Management
Development

Spatial Data Management
Land Administration

Powering Modern Land Administration Systems
Land Administration Systems
GIS is the Technology Platform

Cadastre Mapping
Property Valuation
Transaction Analysis
Survey Data Management
Field Data Collection
Address Systems
Resource Leases
National Data Portals

Powering Land Administration Systems Worldwide

Powering Land Administration Systems Worldwide
GIS Is Advancing Rapidly
Driven by Exponential Technological Advancements

Web GIS
Easier, Open, & Accessible

GIS Innovation
Computing Infrastructure
Data
Scientific Measurements
Drones
Surveys
Location
Demographics
Weather
Traffic
Imagery
Crowdsourcing
3D
Lidar
Real-Time Video
Mobile
Web Services
Cloud
Distributed Computing
Microservices
SaaS
Networks
AI & Machine Learning
Faster
Real-Time
Python
Modern Desktop
Dynamic Image Processing
Advanced Analytics
Open APIs
Data Exploration
Hub
Apps
Online Content
3D
Open Data
AI
Smart Mapping
Expanding the Power of GIS
Web GIS Is the Modern GIS Architecture
Helping Everyone Do Their Work Better

Leveraging Web Services

Communities

Organizations

Departments

Teams

Individuals

Sharing and Collaboration

Distributed and Interconnected

Engaging Everyone
Web GIS Is Driving Digital Transformation
Helping Organizations Reenvision Their Workflows

Sequential Workflows

Simultaneous

Integrated Operations

Digital Transformation

Changing How Organizations as a Whole . . .
. . . Do Their Work
Web Maps Engage and Interconnect . . . Everyone
Providing a Common Language

Supporting Communication and Real-Time Awareness

 Communities

Organizations

People

A Common Framework . . . for Collaborating and Problem Solving
Collector/AGOL

Enabling New Workflows with High Accuracy

Android

LADM

Choose your own GPS
Colombia – Fit-for-Purpose

- Data model LADM / STDM
- Trimble R1 GNSS (sub-meter)
- Orthophotos basemap (digital)
- Collector for ArcGIS on Android
- Cloud Data Storage (spatial and legal)
- Collect Once - participatory aspect
GIS Enables All Land Administration Workflows

Providing a Common Data Management Platform

Leveraging Data Driven Analytics and Visualization

Public Engagement
Visualizing
Analyzing
Modeling
Parcel Management
Field Data Collection

Responding rapidly to changing expectations....
Comprehensive Spatial Analysis & Modeling

Enabling better understanding through geospatial data science
Artificial Intelligence and Machine Learning

GIS Includes ML and Integrates AI

- Clustering
- Prediction
- Classification
- Regression
- Interpolation
- Object Identification
- Feature Extraction
- Site Selection
- Event Prediction
- Image Analysis

GIS

- Density-Based Clustering
- Forest-Based Classification and Regression
- Empirical Bayesian Kriging Regression Prediction
- Training Data Preparation

Machine Learning Geoprocessing Tools

Frameworks
- CNTK
- TensorFlow
- scikit-learn

Platforms
- Microsoft
- IBM Watson
- Amazon

AI

Feature Extraction
- Accident Prediction
- Feature Identification
- Property Condition Survey

Python Integration
GIS
The Smart Platform for Land Administration

Providing a complete, configurable, open and scalable solution.....
Sharing, Open Data & Hubs

https://geohive.ie/
Community Engagement
Organizing and Managing Community Interactions

Providing Citizens Information . . .
. . . And Leaders Input

Citizen Communication
Storytelling
Status Reporting
Design Feedback
Citizen Surveys (Crowdsourcing)

Community GIS Hub

Policy Based Initiatives
(transportation, Housing, Parks . . .)

Community

Government
Engage your community

Adopt Initiatives

Create sites

Discover open data
GIS Hub | Is Transforming Public Engagement and Collaboration

Organizing and Leveraging Stakeholder Interactions

Open Data

Policy Initiatives
Initiative Framework

Community Portals
Apps
Story Maps
Identities

Performance Dashboards

Smart Communities

Stakeholders
- Government Leaders
- Community Leaders
- Universities
- NGOs
- Citizens

Initiatives
- Open Data
- Community Portal
- Performance Reporting
- Urban Planning
- Demographic Reporting

Smart Land Administration Enables Smart Communities
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ArcGIS

Empowers All Aspects of the Organization

System of Insight
Analytics, Models, and Data Exploration

System of Record
Data Management and Integration

System of Engagement
Sharing, Collaboration, and Dissemination

Open Data

Parcels

Value Analysis

. . . Leveraging the Power of Location
GIS
The Platform for Land Administration

Providing complete, configurable, open and scalable solutions.....
GIS
The Platform for Land Administration

Providing complete, configurable, open and scalable solutions…..
Land Administration

Focused solutions on key operational areas in your organization

- Open Data
- Value Analysis
- Field Operations
- Parcel Management

Providing complete, configurable, open and scalable solutions.....