



# abroad



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## IT in Fit-For-Purpose land administration: what are the options?

Land administration is about archives and maps. For many years (centuries!) these administrations were paper based. And yes, if this fits the purpose, they still can be. But in practice the 21st century mostly asks for digital systems or components. Data capturing, management and publication concern bits and bytes: Information Technology. But what are the options? What is the best choice? A question that in most of our projects comes to the fore at a certain stage. And guess what: it is a difficult question to answer for an advisory organisation like ours. Why? Because we want to be independent in our advice and there is no such thing as one best solution. But the question is valid.

Therefore we have chosen to make IT in land administration the theme of our special issue for this year. Not by answering the question, but by asking a variety of IT specialists about possible solutions. It is not an attempt to be complete, to promote preferences or to rank solutions. It is only meant to give an overview as a starting point for your inspiration. In implementing Fit-For-Purpose land administration (FFP LA) IT will come your way, that's for sure.

### People, parcels, rights

Conventional land administration systems can deal with conventional types of land rights and are parcel based. Many customary and informal types of tenure cannot be included in such systems. The guidelines for Fit-For-Purpose Land Administration approaches call for 'Flexible IT approach rather than high-end technology solutions'. Local land recordation systems may be required in order to include use rights. Conversion is needed from one step on the tenure ladder

to another. Participatory approaches in data acquisition for linking people to polygons are possible by using apps with simple and user-friendly interfaces. Or they may require paper-based approaches for the use of imagery in the field – combined with tablets or questionnaires for the collection of administrative data.

### IT in the Fit-for-Purpose approach

In this issue you can read about open-source and closed-source software solutions. About the use of services in support of the full workflow in land administration. About full area coverage and the link between spatial and administrative data. About the need for standards and flexibility.



Kees de Zeeuw and Christiaan Lemmen

## Complete FFP Solution based on LADM from Esri

GIS Technology has evolved from tools and capabilities requiring customisation to out-of-the box domain-specific solutions that can be easily configured to get land administration projects up and running quickly. Leveraging today's technology, Fit-For-Purpose land solutions have everything you need to get started including global base maps and imagery, secure data storage and access, and works on Android devices and web browsers.

Most communities in developing economies lack IT capacity. A new approach, piloted in Colombia and Kenya, utilising LADM delivers a complete solution for the mapping, management and publication of land information, quickly. Operating on open standards, ArcGIS delivers the ability to use any GPS connected to an Android device and work disconnected from the internet or cellular network. This technology is accessible and delivered via a programme for resource constrained organisations. Partner organisations leveraging this technology include the Cadasta Foundation and Medeem.



Brent Jones | [www.esri.com](http://www.esri.com)

## Cadasta's documentation of land and resource rights

Cadasta Foundation documents land and resource rights for those left out of formal land administration systems. Cadasta works to address land administration constraints with easy-to-use digital tools and technology designed to help its partners efficiently collect, manage, analyse, store, and share critical land and resource rights information.

The Cadasta platform is built upon a foundation of Esri technology, including a suite of mobile and web-based tools designed to collect multi-layered information about people's relationship with land and resources, including spatial dimensions, imagery from drones, digital maps, video or audio interviews, photographs, paper attestations, tax receipts, et cetera.



The flexibility of the platform allows for data collection in a variety of ways; whether using GPS-enabled smartphones and tablets, paper-based forms combined with satellite imagery or handheld GPS devices.

Cadasta's Fit-For-Purpose digital tools allow partners to collect data quickly based on their specific needs. By creating an

accessible digital record of land, housing, and resource rights, we help empower individuals, organisations, communities, and governments.



Frank Pichel | [www.cadasta.org](http://www.cadasta.org)

## Participative Land Registration with Meridia Collect



Could the Meridia Collect approach be used by communities to verify their boundaries and collect legal data, be affordable and still comply with government regulations for a land title?

This was the task at hand in Indonesia earlier this year on request of Kadaster and their Indonesian counterpart ATR BPN. We launched pilots in two villages on Java and Sumatra. Our team worked

on building a flexible and Fit-For-Purpose hardware solution, which interchangeably uses the most appropriate hardware. We also spent significant time on adapting our mobile app, to be conducive to the social situation on the ground.

The result was compelling. We managed to meet the criteria for a swifter and cheaper process, while still maintaining the necessary legal and accuracy standards required by the government. A few weeks later, hundreds of happy landholders got the land titles they had helped to document from scratch.



Simon Ulvund | [www.meridia.land](http://www.meridia.land)

# New and Emerging Technologies

Rather than mandating a single surveying specification for capturing land rights across an entire country, the FFP approach supports flexibility in adopting a variety of techniques to capture the land rights depending on local circumstances. However, it is also a highly participatory approach and requires tools that can be simply used by citizens or locally trained land officers.

This wide choice of technical approaches and tools does require the designers of FFP projects to be familiar with and able to select the most suitable options from the myriad of emerging technologies and solutions that show significant promise in accelerating the process.

Recently, a World bank Guide on "New Technology and Emerging Trends: The State of Play for Land Administration" was released. This guide provides designers of country-specific FFP Land Administration strategies with guidance on the most appropriate technical solutions to be adopted in designing and implementing the Spatial Framework for the FFP Land Administration approach.



It aims to ensure that the capture, management and dissemination of land rights information will be achieved using the most cost-effective solutions, meets the precision and accuracy requirements, matches the technical resources within the country and is compatible with social cultures. This guide was led by Kathrine Kelm and sponsored by the Nordic Trust Fund.



Kate Fairlie and Robin McLaren

The document is [online](#) available. Comments and feedback are welcome and should be directed to Kathrine Kelm, Senior Land Administration Specialist at the World Bank, [kkelm@worldbank.org](mailto:kkelm@worldbank.org)

## Technical Implementation of the Social Tenure Domain Model (STDM) Tool

Existing Land Administration Systems require extensions to include all existing types of tenures. This is the advocacy behind the continuum of land rights approach, but the need for this is not always recognised and institutional changes are not so easy to implement. The STDM tool allows for the recordation of all possible types of tenures.

Its application of open source software components is primarily aligned with the core values of the Global Land Tool Network: affordability, scalability and sustainability. STDM allows non-technical users to define and manage tenure information, link supporting documents, visualise spatial units and produce custom reports. The use of PostgreSQL and PostGIS guarantee users with spatial data management features that are extensible, protect data integrity and can be deployed from standalone setups to enterprise environments. The application of QGIS provides users with a rich environment for visualising and managing spatial data.

The release of the STDM tool as an open source project allows others to adopt and build on top of it, in order to meet their specific land information requirements. It is based on the user-friendly Python programming language with the source codes freely available on GitHub: <https://github.com/gltm/stdm>.



John Gitau

## The SOLA family of open source software

The SOLA family of open source software is to provide countries and communities with affordable, adaptable and sustainable solutions to support the adoption of the Voluntary Guidelines for the Responsible Governance of Tenure. The SOLA software supports both formal and informal recording of tenure rights.

SOLA Registry supports registration and cadastral functions undertaken in a typical land office. It has a scalable architecture from several thousand parcels/certificates to several hundred thousand - including a digital archive and business rules to validate and maintain the integrity of the LADM based database.

Open Tenure provides communities with a low cost, low tech option to map and record tenure interests. Open Tenure is implemented on commonly available Android mobile devices with the field data being consolidated on a server by an internet connection to a cloud based server - or wirelessly to low cost, low power 'stick PC'. Open Tenure is also being used in formal land administration for both data capture (with data transferred to SOLA Registry) and first time land certification (with field data transferred to SOLA Systematic for public display and certificate production).

Visit the the SOLA open source community website [www.flossola.org](http://www.flossola.org)



Neil Pullar



# Managing land information through LADM

The Land Administration Domain Model (LADM) is the global stand for managing land information, which facilitates the communication and understanding of land information as well as allows the exchange of land administration data or aggregation of data from different sources in a coherent manner. The cadastre data model based on LADM provides the core structure for securing property rights and facilitating the land market, as well as extending to a variety of other uses such as urban planning, taxation, natural resource management and the utility cadastre. LADM allows for vendor independent management of data across both government and non-government units which can then be integrated from local to national, regional and global levels. It facilitates more efficient and cost-effective data sharing and management, increased transparency and monitoring of land information and, ultimately, enables more informed decision making. Both developed and developing

countries can benefit from the use of this important standard to ensure that land administration systems are built with data that are comprehensive, properly structured and readily available to address some of the sustainable land and natural resource management challenges we face today.



Kathrine Kelm  
Romyana Tonchovska



## OGC, open standards and Land Administration

The Open Geospatial Consortium (OGC) has undertaken extensive work related to Land Administration, including the development of open standards such as Landinfra, CityGML, and web services standards, which allow the sharing of data and information to stakeholders and the public.

OGC's Land Administration Domain Working Group provides a forum to explore interoperability standards and best practices, and for connecting suitable technology for data linkage and quality assessment. Further, the Land Administration DWG is working to provide a common vocabulary for the locational aspects of land administration databases. OGC collaborates through this group with other related standards and domain organisations, including ISO / TC 211 as they update the Land Administration Domain Model (LADM).

OGC will soon publish a white paper that provides an overview of current standards and proposes actions required for the design and development of new implementation standards relevant to Land Administration.

Administration of land records is already a complex process; through the use of open standards, practitioners are able to develop consistent approaches to records management, share data, and expose information to their stakeholders and the public.



Denise McKenzie | [go.myogc.org/LandAdmin](http://go.myogc.org/LandAdmin)

## Domain Models for Information Infrastructures

A standard is an agreed way of doing something. The Land Administration Domain Model (LADM) is in essence a knowledge model: multiple experts from all over the world have been involved in its development. Land administration is not a domain in itself. There are relations with other domains such as persons, addresses, valuation, land use, land cover, utility networks, archives and taxation data. Availability of ISO standards for all those domains (which is not yet the case) would be a foundation for the establishment of governmental information infrastructures globally. The Netherlands

developed a system of key registers where data needs to be taken from the authentic source, within the EU INSPIRE directive. The LADM provides stereotype classes for these other data sets, which indicate what data set elements the LADM expects from these external sources. This is relevant for the further development of domain standards. Standardisations are huge efforts – so a lot of work is to be done.



Peter van Oosterom

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