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Engaging the Private Sector in Land Data Management

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> It would take the few dozen licensed surveyors in Uganda more than a thousand years to legally register the countries estimated 15 million parcels of unregistered land.
>
> —Frank Pitchel, Cadasta[1]

Everywhere in the world, the management of land is a core function of government. As a consequence, the process of cadastral updating is, necessarily, administratively-driven. However, the benefits of improved land management systems accrue overwhelming to citizens and private-sector companies in the form of greater transparency, improved efficiencies, and, importantly, the opportunity to design and deploy business services built on land data. The rapid development of digital technologies provides land administrators with a powerful array of new tools for engaging the private sector not only in utilizing land data resources, but also in contributing actively to their development.

In their most basic form, cadastral updates have focused on the digitization of paper records. In most settings, this alone is a very challenging and costly task. More ambitious projects have sought to shift the framework from traditional Land Administration Systems (LAS) to Spatial Data Infrastructures (SDI) in which land data are organized in stacked layers (multipurpose cadaster) encompassing various categories of data (legal, tax, environmental). The creation of such data systems typically involves successful coordination among multiple government ministries or agencies, and the integration of data from multiple data "silos".

From an operational standpoint, some administratively-centered efforts have opened their systems to allow for citizen-driven approaches such as Interactive Community Mapping (ICM). Others efforts have been more technologically-driven, including conventional, commercial initiatives on a proprietary/consulting model (ESRI, Thomson Reuters); open source platforms and toolkits (SOLA, STDM, MAST, CADASTA); and a new generation of Blockchain-based

[1] Frank Pitchel (2017), "Can technology revolutionize efforts to secure land rights?" LEGEND Land Policy Bulletin, Issue 7 (March).

projects such as those undertaken, with varying degrees of success, in Honduras (Factom), Ghana (Bitland and BenBen), The Republic of Georgia (Bitfury), and Sweden (Chromaway).[2]

As valuable as such initiatives are, they have one shared deficiency: They tend to take the institutional structure and motivation for the work—the "Why?" of the problem—as a given, starting instead with the technical dimensions of the work—the "What?" of the problem. In reality, when it comes to land management systems, neither the institutional structure nor the motivation for the work are generally fixed. Instead, the boundary between the public and private sector is the outcome of a constant process of negotiation, balancing public and private benefits, in which technology plays a central role.

Based on a data gathered during a year-long customer discovery process in three countries, this paper summarizes an approach for engaging the private sector in improving land management systems. The starting point for this approach is placing economic opportunity—rather than administrative needs, technology, or legal rights—at the center. Such a system creates an end-to-end system—with a high-integrity data resource on one end and sustainable economic opportunity on the other—that takes social context seriously and is driven by holistic understanding of market need. Through staged, progressive experiments rather than one-time administrative pushes, such an approach to connect social and technological resources to create local ecosystems of opportunities.

Starting with the "Why?"

Land Management Problems Faced by the Private Sector

Broadly considered categories of participants in land systems are government (at different scales), the private sector, and citizens/residents (both individually and as communities, and including foreign participants). Each category of participant in land systems has different idealized incentives (leaving aside encroachment and illegality):

- **Government** wants to maintain control over, and effectively perform, the function of documenting and enforcing property claims.
- **Citizens/residents** want to access flows of services and earn dividends from assets (low transactions costs for both).
- **The private sector** wants to provide flows of services and earn dividends from assets (low transactions costs for both).

The private sector faces challenges that can be addressed by improved land management systems in five categories:

- Searching / locating
- Conducting diligence (ownership and attributes)
- Negotiating
- Registering

[2] A final category of approaches consists of rights-driven advocacy and legal reform efforts by land rights or conservation activist non-profits such as ILD and AIDESP.

- Enforcing / Resolving disputes
- Surveying
- Brokering

Private Sector Challenges Faced by Land Managers

Land managers, in turn, face three major private-sector related challenges with regard to land:

- First, in the absence of effective land management systems, property either remains underdeveloped or inappropriately is used (for example, in the case of informal construction in flood zones)
- Second, even those with valid claims under-invest due to insecurity
- Third, because land generates inadequate opportunity, absentee ownership proliferates.

To illustrate this with a concrete example, consider the example of land-water flood data and the insurance industry. In 2017, heavy rains powered by El Niño conditions drenched parts of Peru with 10 times more rainfall than normal, overflowing rivers and causing mudslides to destroy roads and farms. The flooding resulted in hundreds of deaths and displaced thousands of people. Major insurance companies operating in Peru have historically been unable to offer hazard or flood insurance in affected regions because of a lack of water-level or flood-map data. This information exists in communities and on occasion in local government records in paper form. But in the absence of any effort that converts or collects it into a digital database, it is impossible for private sector insurance vendors to have the necessary data to manage the risks and offer business products/services such as insurance products. As a result, tens of thousands of Peruvians suffered catastrophic loss; the private sector was unable to offer a compelling business service; and the government was forced to react to a major disruption to the economy, rather than prepare for it successfully.

Our primary thesis in this paper, illustrated by the example of the 2017 floods in Peru, is that the conflicts that have plagued land administration for decades are an almost inevitable consequence of the manner in which land data are gathered and structured, which in turn is determined to a significant extent by the technologies employed. Centralized, paper-based land management builds an asymmetry of information into the public-private system that ultimately makes land management a reactive activity rather than an anticipatory one—as well as one subject to a variety of abuses and exclusions, both public and private.

Environmental land issues and the mining industry are a case in point. The public good that is the preservation of the environment is one social imperative (and, some might argue, even moral). However, the creation of economic prosperity and livelihood that comes from the presence of industry such as mining is also a social imperative. Often, the boundary between mining issues and environmental issues is a contentious one as the balance between different imperatives gets skewed by either ignorance or an imbalance of power—and the asymmetry of data access and data literacy that underlies both.

As we will describe below, one alternative to the current default system is a “smart contract”: essentially an agreed-upon protocol in which protocol execution is built into protocol

construction. Smart contracts follow rules based on data—think, for example, of traffic-monitoring camera that generates speeding tickets, or a vending machine that generates snacks, both under certain well-specified conditions. Similarly, metering protocols around environmental- and mining-related land data could defining the conditions under which a smart contract executes automatically. Put differently, a consistent stream of correlated data in both arenas would allow us to create a Dynamic Negotiated Consensus between all the participants, thereby avoiding the typical conflict that arises in such situations. The key element is the trust all stakeholders have in the integrity of the data system and the protocols that the data drives, which in turn (arguably) have their roots in the inclusiveness of the process of data creation and validation.

The "How"

In the context of land-management systems, getting from rigid public-private boundaries and closed data systems to smart contracts activated by Dynamic Negotiated Consensus requires **five paradigmatic shifts**:

- **From two-dimensional, paper, land records to multi-dimensional, digital, land profiles** representing multiple, socially-relevant attributes of a place. *Land records and data become digital, richer and contextually relevant.*
- **From the management of land to the management of land data.** *Digital technology enables shared understanding and information symmetry to an extent not previously possible.*
- **From centralized land registries authenticated by a government to distributed ledger authenticated by a community of users.** *The creation of land data becomes a collaborative, community effort.*
- **From rights and responsibilities,** seemingly principled by inevitably confrontational**, to dynamic negotiated consensus,** seemingly invasive but potentially liberating. *Ad hoc decision-making and rent-seeking is replaced by rule-based decision making and opportunity creation.*
- **From land ownership**, with a focus on maximizing asset appreciation, **to land stewardship**, with a focus on maximizing asset yield. *Incentives are re-aligned toward doing more with land rather than merely exchanging or acquiring land.*

To operationalize this hybrid approach requires combining traditional spatial data infrastructure rollout with a next-generation technology-enabled digital community collaboration. The latter also identifies user applications that would both accelerate adoption and share the economic burden away from the public sector. In particular, creating a market "pull" rather than an administrative "push" imperative for technology allows for the reverse flow, thereby making the recipient more than just a passive participant.

The "What": Implementation of a Twenty-First Century Approach to Land Management

Five Technologies of Transformation

Mobile technology refers to devices that are both transportable and offer instantaneous access to information. While this term includes many devices—typically (2G) "dumb phones", smartphones, and tablets—mobile devices all store data and allow for real-time communication. The hallmarks of mobile technology are portability, flexibility, simplicity of use and cross-platform integration. They are ubiquitous and are utilized for communication, computation, and the control of systems, among many other tasks.

Cloud computing is a method for delivering information technology services in which resources are retrieved from the Internet through web-based tools and applications, as opposed to a direct connection to a local server. The term cloud computing is used because the information being accessed is found in "the cloud" and does not require a user to be in a specific place to gain access to it.

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Crowdsourcing land data is simply participatory mapping way or community surveying powered by twenty-first century technology. Smartphone-based data-input systems are immediately translated to synchronize with existing layered land registries. The use of crowdsourcing improves the efficiency of data collection and creates improved usability as well as integrity of information gathered. Data security enhanced by storage in secure cloud-based redundant servers.

Blockchain-based platforms for registering land title and informal land claims enable several capabilities; firstly it links evidence, claims, transaction histories, and boundary maps, secondly it enables management of data at low cost and focuses scarce resources on crucial task of expanding coverage, thirdly it enables competing land claims to be quickly identified, potentially resolved via semi-automated dispute resolution system and allows undisputed informal claims to be reviewed or formalized and finally it spurs innovation around applications of this information

Deploying Human-Machine Systems at Scale

The creation of employment opportunities due to the roll-out of cadastral updates in the proposed manner can occur in stages that correspond to the layers of the technical system:

- **In the first stage**, the digitization and validation of existing land records requires a large-scale, one-time-only, investment that will constitute a "Marshall Plan" for digital skills and property rights on a country-by-country basis.

- **In the second stage**, broad-based access to property records allows individuals and businesses to pledge assets as collateral, democratizing access to credit. Widespread access to credit on competitive terms is, in turn, a key to economy-wide employment growth.
- **In the third stage**, property systems combine with existing (indeed, in most places, rapidly improving) digital infrastructures to form digital platform upon which innovation in adjacent goods and services occurs—including some that can be readily anticipated before the fact, and others that can not.

In this way, the development and deployment of cadastral updates has potential to address simultaneously two distinct development imperatives: catalyzing digital opportunity and upgrading systems of digital rights.

Back to the "Why": Social Impacts

Five primary types of social impacts may result from taking an opportunity-led approach to updating land management systems:

- **Increased economic participation** through the creation of land-based opportunity (without the requirement of ownership redistribution).
- **Expansion of digital skills** via education and project-based learning-by-doing.
- **Improved land administration and increased land-based economic inclusion** through the de-facto development of relevant data to support land administration. This will be achieved via crowd-sourcing mechanisms and via improved authentication and verification achieved using Blockchain technology.
- **Environmental dividends** realized through the provision of a platform and services that increase transparency and collaboration with mining industries around environmental and ecologically sensitive land areas.
- **The specific inclusion of women and indigenous people** through the de-facto provision of greater negotiating leverage via transparency and better access to records and processes.

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Both "Land and Poverty" and rights-based approaches as a solution to the challenges of land administration are frameworks that have their roots in poor data and misalignment of interests. If we empower the citizens—including the poorest—as data gatherers and validators, then the equitable management of land may follow in the next era of land management as naturally as conflict has in the current era.

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