

## Cross-cutting challenges to innovation in land tenure documentation

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### ABSTRACT

Since around 2011 pilot projects to innovate land tenure documentation are being implemented in various countries in the global south in order to address the shortcomings of formal land registration. A longer-term question, underlying the present study, is how these innovations relate in the longer run to existing institutional arrangements of land governance in the respective context of implementation. Guided by this more general question, we discuss in this paper first the characteristics for 6 of these approaches. And second, we discuss four closely related challenges identified through a thematic analysis from interview transcripts with representatives of the initiatives. Regarding characteristics, we find a basic commonality of the initiatives is the general approach to tenure documentation through community based digital data capture, in many cases via mobile applications, and the acknowledgment of the plurality of land tenure regimes, which are often not accounted for in statutory land tenure registration laws and/or administrative procedures and practices. Looking at the initiatives in more detail a number of differences become apparent in terms of financing mechanisms and organizational characteristics, as well as application domains. We identify four challenges in the process of implementation. One is the need to strike a balance between inclusion of diverse land tenures, on one hand, and necessary adjustments to existing institutional norms and regulations in land governance. A second pertains to questions of purpose and longer-term goals as implementation requires a fair amount of flexibility in practice. The third challenge relates to the question of the legitimacy of both collected digital data and the paper documents that are being issued. And finally, on the side of digital data production, a longer-term challenge pertains to finding a good balance between transparency and openness, on one hand, and protection of people's land data, on the other. Based on these challenges, we discuss directions for future implementation, evaluation and research.

### 1. Background

Developing countries experience multiple challenges in securing rights to land through processes and techniques of formal land administration. Problems of tenure insecurity, limitations of availability of tenure information, and the recognition of the high costs of implementing comprehensive, large scale land information systems (LIS) through public agencies or international bodies triggered dialogues that promote alternative approaches to generating and managing tenure rights on land. In how far formal registration of land rights is necessary and for whose benefits is one point of continued debate. [Fourie \(2001\)](#), for instance, highlights the need for formal registration systems specifically to provide the poor both tenure security and access to spatial information through appropriate spatial data infrastructure, if the latter explicitly accommodate multiple forms tenures ([Fourie, 2001, 2002](#)). Especially the urgency for governments to improve infrastructure and services in regions with high rates of land conversion and urbanization in institutional settings characterized by complex dynamics between

“informal” and “formal,” “customary” and “modern,” “incremental,” and “master-planned” practices of urban land use and change ([Benjamin, 2004](#); [Hull, 2012](#); [Kingwill, 2014](#); [Roy, 2009](#)), make it difficult to establish a large-scale LIS or Spatial Data Infrastructure (SDI).

In light of these difficulties [Deininger \(2003\)](#) and [van der Molen and Lemmen \(2006\)](#) suggest that increasing security of tenure does not require issuing formal individual titles, because more simple and less costly measures inspired also by the concept of the continuum of land rights ([UN-Habitat, 2008](#)) could be better alternatives. Successive and extensive dialogues led to the development of the Land Administration Domain Model (LADM) – which became a Draft International Standard (DIS) in 2010 and later an International Standard Organization (ISO) standard in 2012, and its special version (software), the “Social Tenure Domain Model” (STDM) in 2010 ([LADM ISO Standard, 2012](#); [Uitermark et al., 2010](#)). The LADM is a conceptual model that provides an overview of requirements and standard packages for organizing land administration information, including information about people and organizations, as well as tenure rights and spatial units (parcels) and

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documents to support diverse tenure rights. The timespan between 2008 and 2014 also witnessed the emergence of the concept of pro-poor land recordation and presently culminated in the idea of fit-for-purpose approaches for land administration (FFP LA) (Enemark et al., 2014a; UN-Habitat, 2008; Zevenbergen et al., 2013). Fit-for-purpose promotes designing the land administration systems with the explicit vision of prioritizing the needs of the people and their relationships to land at a given point in time. In a FFP LA the underlying spatial framework for large scale mapping is designed to manage land issues at local or in country context, rather than strictly following bureaucratic and technical standards of the conventional registration systems (Enemark et al., 2014b). FFP LA, specifically LADM and STDM based approaches, provide a philosophy and a model for capturing tenure rights, including social tenures at the local level/community level, while using participatory approaches in the tenure recordation process.

A number of initiatives specifically leveraging mobile technologies for data collection have emerged to record, manage and store tenure information at local community level. Scaling up of such local level tenure documentation activities could in the longer run support the FFP frameworks (Hendriks et al., 2019) in different places and together contribute towards realizing countrywide availability of tenure information. These initiatives aim for higher speed and lower cost in tenure documentation, and address the concerns of weak administrative and legal statutory environments by advocating for openness of land tenure information for informed decision making by third parties (e.g. large scale investors), and by emphasizing the importance to document the existing diversity in land tenure systems and rights. They expressly aim to include women's and other vulnerable groups' rights. The label "pro-poor land tools," which is sometimes used as an umbrella term for the initiatives we describe here, reflects the aim to address especially the needs of the poor population, because it has been recognized that poor and marginalized groups have been neglected or negatively impacted by land rights documentation efforts in the past. Therefore, these new initiatives aspire to work with community driven and/or community generated digital data with the eventual aim of strengthening tenure security for as many people as possible.

In the emergence of these initiatives around 2011 and the associated discourses we see several policy and technological developments from the past 20–30 years converging. On the policy discourse side these include aims of improved efficiency (saving costs and time), open and transparent government, and the ideal of widespread participation of land stakeholders including citizens, politicians and actors from professional bodies. The aim of efficiency has driven e-government and LIS development since at least the 1980s and 90s stemming from an era of new public management in public administration (Homburg, 2008). Especially since the 2000s the visions of open and transparent government have been promoted through worldwide Freedom-of-Information (FOI) legislation and open data government initiatives inspired by the U.S. Obama government (Georgiadou et al., 2014). These global policy discourses and longterm aims stand in dialogue with parallel developments of the internet. This evolved during approximately the same time from a mostly read-only Web 1.0 to the interactive and semantic Web 2.0 and 3.0. Accompanied by a global spread of mobile internet and phone devices as well as urban sensor networks the technological environment now provides a wide spectrum of possibilities for the public to also provide data to the government, interact with authorities via the internet, and to publish data via internet based services and portals. Further catalysts to the emergence of innovative approaches for tenure documentation are the growth of the open source software community (Dabbish et al., 2012); improved access and accuracy of geospatial data, as well as increased computing power and data storage space.

In sum, at least three trends gave rise to the development of innovative approaches to land tenure documentation. First, the difficulties in and the high costs of implementing comprehensive, large-scale land information systems through public agencies was recognized and

led to continued debate on the pros and cons, but also the how-s of recording land rights and tenure regimes in developing countries introducing the notion of fit-for-purpose land administration. Second, the initiatives incorporate visions from policy discourse at international scale, including aims of improved efficiency, openness and transparency, as well as citizen participation. Third, the approaches leverage new mobile and Web2.0 technologies that have emerged in the past 20 years for data collection, storage, and exchange, including mobile apps, online platforms, and cloud services.

In recent years innovative approaches have gained visibility through a variety of platforms, including traditional media, websites and social media; and through various events, such as professional meetings, conferences, workshops, seminars, and publications<sup>1</sup>. Comparative overviews of initiatives similar to those discussed in this paper have been made for individual countries, for instance by Somerville et al. (2017) for Zambia. McLaren et al. (2018) have developed a practical guide for implementing new technologies for land administration, including crowdsourced data and drone technology for data capture. This guide also offers a comprehensive overview of emerging trends in land administration through various case studies. Our study seeks to contribute to the growing body of knowledge about the general nature of new technology trends in land administration and specifically contributes by outlining a set of cross-cutting challenges encountered by initiatives seeking to innovate land tenure documentation. In the final instance and based on the identified challenges we propose a series of future considerations for the implementation and evaluation of innovative approaches going beyond technocratic elements by shifting into focus questions related to the broader context of land and data governance.

Our paper is structured according to these aims. After describing our methodology in terms of conceptual approach and data sources and analysis, we describe general characteristics of 6 initiatives in Section 3 of the paper. In Section 4 we identify at a more abstracted level four main challenges that span across the initiatives. These descriptions and the challenges then provide the basis for Section 5, where we distill a set of directions and questions for future research and for the longer term evaluation of the initiatives.

## 2. Methodology

### 2.1. Conceptual framework

We begin by describing the initiatives in terms of their organizational characteristics, financial and technical aspects, as well as scope and the application contexts in which they are implemented. As such our study does not seek to make a theoretical contribution in the first instance. One reason for taking this approach at the present moment is the relative newness of the initiatives and a sort of mushrooming of like-minded projects under changing labels and definitions. The empirical scene therefore warrants an approach that does not settle on a theoretical frame too early but allows for some experimentation with different conceptualizations to identify patterns in the empirical scene that unfolds before us. This allows for a more inductive analysis at this stage for choosing appropriate theoretical and explanatory frameworks later on. For example, each of the challenges we identify in Section 4 may call for different theoretical explanations in future research, but at this stage the aim was to first identify the types of challenges based on the material at hand.

Nevertheless, a longer-term question that informs our research is also theoretically relevant, namely: how these data technology driven approaches, often initiated by foreign actors and/or non-governmental

<sup>1</sup> Example references <http://glt.net/index.php/publications/publications/publications-list/send/2-glt-net-documents/2353-implementation-of-responsible-land-governance>.

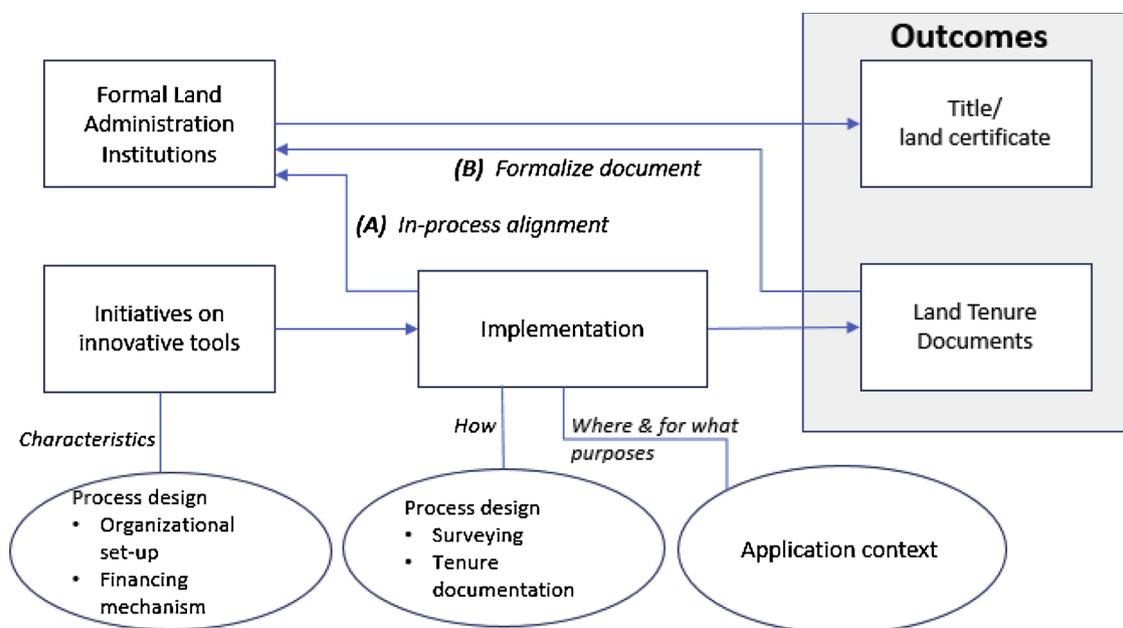


Fig. 1. Conceptual framework on the initiatives, implementation process and outcomes.

actors, come to terms with (or not) existing institutional and regulatory frameworks around land governance. Driven by this underlying question our research approach is summarized in the preliminary conceptual scheme shown in Fig. 1.

The conceptual scheme emphasizes the initiatives’ characteristics and their implementation process. We focus our description on organizational set-up and financial mechanisms as main distinguishing characteristics between the initiatives. These in turn influence implementation processes and different initiatives’ application contexts. We describe differences between initiatives in terms of tenure data capture (surveying and documentation). An initiative may either implement tenure documentation in liaison with the formal land administration system, i.e. following path A in Fig. 1, or (at least initially) work in parallel to the formal land administration domain, i.e. following path B in the diagram. The latter approach would lead to issuance of documents as evidence of land and/or property holding, especially de facto tenure rights, and would require additional processes in order to upgrade to formal tenures (title or some form of state endorsed official land certificate). In this paper we use the term “de facto tenure” as short for legitimate tenures that are not currently protected by statutory law and which draw their legitimacy from social and non-statutory institutions (Wallace, 2010), but we also use the term for forms of tenure that may be captured in statutory law, but recognition through official documentation and/or registration are lacking (see for example Abubakari et al., 2018; the term we use is also in reference to “de facto tenure security” as defined and described by van Gelder, 2009, 2010).

What emerged from this descriptive, initiative-by-initiative analysis, were a number of challenges that are encountered during implementation. These challenges cut across the initiatives regardless of their differences in characteristics and implementation processes. As such these challenges provide a preliminary set of findings at an abstracted, that is more theoretical level, in response to our more long-term, underlying question formulated above.

## 2.2. Data sources and analysis

Our familiarity with the innovative approaches discussed here stems in large part from our work in developing and running an MSc program in Geoinformation Science for Land Administration at the ITC faculty of the University of Twente. This program advocates for responsible land

administration (Zevenbergen et al., 2015) and offers a course on “Innovative Approaches for Land Administration” in its curriculum. Since 2007 developers of innovative tools have been invited to lecture and demonstrate their tools to Land Administration graduate students and staff at the faculty. The developers are i) The Global Land Tool Network (GLTN) of UN-Habitat on the Social Tenure Domain Model – STDM<sup>2</sup>; ii) Food and Agriculture Organization (FAO) of the United Nations (UN) on SOLA; iii) Landmapp<sup>3</sup> on Landmapp; iv) Cadasta on Cadasta; and v) Thomson Reuters on Aumentum OpenTitle. It should be noted here that Landmapp has been renamed to Meridia (<http://www.meridia.land/>), but throughout this paper we will refer to it by its previous name, because it was under this name that we conducted the interviews and prepared first drafts of the analysis. In the course, MSc students also explored through assignments the functions and applicability of innovative tools to document tenure rights at local level, and explored those innovative tools online, which had not been discussed by developers in class. Our interpretations here are further informed by our involvement in the supervision of MSc student thesis research about the implementation of innovative tools in land documentation as well as through our involvement in related workshops, conferences and seminars and regular communication with actors working in the field of innovative approaches for tenure documentation. In addition, board members from the Cadasta Foundation extended on the list of initiatives compiled by students; and we reviewed the initiatives’ websites, reports and documentation. This led to the identification of four initiatives in addition to the ones mentioned above, which are similar in purpose and nature. The initiatives identified so far are listed in Table A1 in the Appendix A.

Based on the information sources and our involvements described above we developed questions for a series of one to two-hour semi-structured interviews (in person or via Skype) between February to May 2017 with representatives from organizations involved in the development of six approaches: GLTN on STDM; FAO on SOLA OpenTenure (OpenTenure) – other SOLA family tools are designed to support the formal land administration systems are therefore seldom discussed in

<sup>2</sup> STDM was first designed and developed at ITC in collaboration with the Dutch Kadaster in 2007–2009, and was taken up for further development by GLTN as from 2010.

<sup>3</sup> Landmapp has since changed its name to Meridia.

this study; Landmapp on Landmapp; Cadasta on Cadasta; and Thomson Reuters on Aumentum OpenTitle as well as CaVaTeCo. The interview questions related to: i) history of the initiative and overall current organization; ii) surveying and tenure documentation supported by their tools; iii) application context; and iv) the key challenges they encounter before, during and after tenure documentation process. The interviews were recorded and subsequently transcribed.

This paper is the outcome of a first qualitative content analysis (Hsieh and Shannon, 2005), to present differences between the initiatives in terms of financing mechanisms and organizational characteristics, as well as process design and application contexts following the conceptual scheme outlined above. After this first sorting of the material according to characteristics the four cross-cutting challenges were identified during a second reading across all transcripts. The first results were presented in a conference panel in 2017 and shared with interview respondents to check for both factual accuracy in the more descriptive elements of the results; and to receive input on our interpretation of main themes related to challenges in implementation. Later in 2018, the first draft of this paper was sent to interviewees, who revised by correcting or adding information so that it best represented their contribution in this article.

### 3. Overview and description of innovative land tenure documentation initiatives

This section presents results from the analysis of interviews with representatives from 6 of the initiatives (see Table A1). In Sections 3.1 and 3.2 we describe the main differences between initiatives in terms of financing mechanisms and organizational characteristics, as well as process design and application contexts emerge from our interview data following the conceptual scheme in Fig. 1.

#### 3.1. Organizational characteristics and financing mechanisms

Four of the 6 initiatives in our study (\* in Table A1) are small organizations or start up companies while two are under the UN, thus global actors i.e. STDM and the SOLA family. The STDM initiative is championed by GLTN partners at the country level with co-funding by GLTN and given partners on the ground. Initiatives based on the SOLA-family of tools for land tenure documentation are guided by and based in the Food and Agriculture Organization (FAO), as such being part of a large organization with a long history as global actor in the land governance domain. Both are not-for-profit initiatives. Landmapp, Cadasta, Aumentum Open-Title and CaVaTeCo, on the other hand, are developed by relatively small organizations and have different financing mechanisms. Landmapp, a for-profit company, was kick-started by two engineers and has since grown to ten employees and is regarded as a sort-of follow-up of Thomson Reuters' Aumentum OpenTitle. Landmapp is a relatively small organization that is solely dedicated to the development of the tools described here and was founded as a social entrepreneurial company in the market of land tenure documentation. Cadasta is also a relatively small not-for-profit and donor funded enterprise. CaVaTeCo is developed by a private company - Terra Firma in Mozambique - and employs a value chain approach to tenure documentation. It is financed by the Department for International Development (DFID) (United Kingdom), under the LEGEND fund. Regardless of organizational character and financing mechanisms all organizations act globally not only in terms of the places, in which tools are being piloted and implemented, but also intra-organizationally. Cadasta's staff, for example, were located in different countries across the world and held meetings mostly through digital communication until 2018, but have started consolidating around Washington DC.

The main distinction in financial terms is between for-profit and not-for profit initiatives (Fig. 2), where the former need to finance their own efforts through the paid provision of land tenure documentation and data services. Of the six initiatives, the not-for-profit initiatives rely

more on non-proprietary technologies, while for-profit initiatives deploy proprietary software and services as part of their product suite. In the case of not-for-profit initiatives, financial sustainability depends on external, and/or internal funding from within the larger organization, as in the case of the FAO, for example. A basic difference between initiatives lies in the size of the organization and this also influences financial means.

#### 3.2. Process design – surveying and tenure documentation

The initiatives have similar points of departure in the context of surveying and tenure documentation techniques in that all promote and advocate for systematic, participatory methods and local community-based approaches, with special emphasis on land rights for women and other vulnerable groups in urban, rural, post-disaster and post-conflict contexts. Promoters and developers of innovative tools also advocate for openness of land tenure information for various reasons, for instance to improve data sharing for different uses in development and planning, to support improved decision making by third parties, including large-scale investors, but at the same time also to increase transparency of land sector activities for vulnerable and poor groups, who have the greatest difficulties in accessing information administered by government and third parties.

There are two important justifications driving the initiatives. One is the need to support land tenure documentation, where formal land administration's work does not suffice or has failed. The second is to acknowledge, in policy discourse as well as technology design, the diversity of land tenure regimes and legal, normative plurality in land governance. Therefore, we categorize process design in terms of how the processes align with established legal and administrative workflows of i) land surveying and ii) tenure documentation.

For land surveying, all but Landmapp in Indonesia, use the general boundary approach through community based digital data capture, in many cases via mobile applications and advocate for the continuum of accuracy as described in the spatial framework principle of the FFP LA (Enemark et al., 2014a; Enemark et al., 2016).

For tenure documentation, initiatives may follow established legal frameworks and administrative workflows regarding the types of land rights being recorded (most of SOLA family-based initiatives by the FAO, CaVaTeCo, STDM in Uganda and Zambia and Landmapp in Indonesia). Those documenting statutory legal tenures follow closely government requirements in data collection and database design. As such, formal tenure rights as defined in the land laws or the administrative procedures of the government are documented on the parcels.

The initiatives capturing de facto tenure rights and seek to introduce the resulting recorded tenure documents into the formal registration system for recognition by government (OpenTenure part of FAO's SOLA solutions, Aumentum Open-Title, Cadasta, STDM). The aim here is to provide the tenure data to the government for the ultimate issuance of official documents, as information for land use planning and identification of community development priorities (e.g. GLTN) and/or for customary and statutory actors to sign documents at various stages in the process of documentation (e.g. Landmapp in Ghana). The de facto tenure rights are delineated on small lots through piecemeal parcelization for individuals, or on community land. In so doing implementers refer to the Voluntary Guidelines on the Responsible Governance of Tenure (VGGTs) (FAO, 2012), for example as follows:

“VGGTs support the recognition of legitimate land rights. But saying legitimate does not mean that the rights are already recognized in the law. They are legitimate as it is for the customary rights – but not yet recognized in the formal law. So it is important to have a tool in this case that can map and capture information, which are not yet in the law” (representative from FAO for OpenTenure initiative, 19 April 2017 interview).

The adjustment to diverse land rights, which may not be captured in statutory laws or administrative procedures, also reflects in the

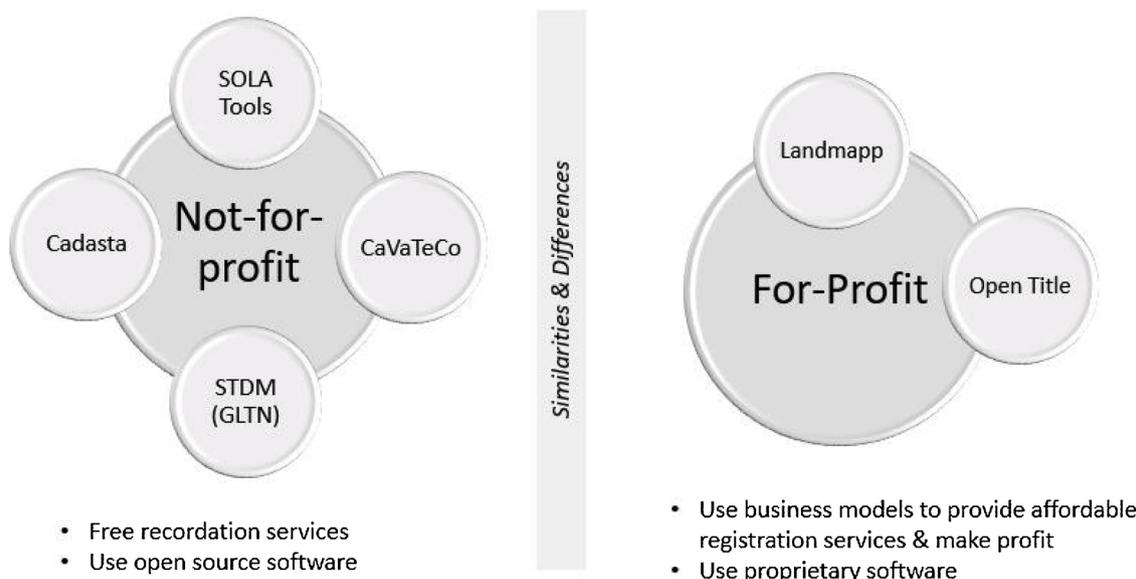


Fig. 2. Types of initiatives: for-profit & not-for-profit.

technological design, for instance of database structures, as the following interview excerpt illustrates:

*“We had some feedback from the users that the software needed flexibility. I mean, like easily adding database fields [relating to different types of land rights], easily adding dictionaries, or values. I mean ... you know you may find that there [is] some legal language that requires [that] you fill in a field in a certain way and there must be some triggers related to that field. Then also [what has] to be filled in is, you know, like current ownership of land, that the woman is recognized, or beneficial interests or that percentages are recognized properly. So I think it’s like any technology implementation – does the way the software has been configured or is being configured in the field meet the needs of the project really”* (representative from Thomson Reuters, Aumentum, 3 March 2017 interview).

The database referred to in the quote above is configured to capture the different types of land rights via a drop-down menu that allows the user to choose one type of rights, which is then linked to a specific land parcel.

According to the implementers of the tools that focus on documenting de facto tenures, the approach supports GLTN’s idea of incremental improvement of tenure rights from de facto to statutory along the continuum of land rights, as well as of spatial accuracy. The latter in turn responds to demands for high accuracy surveys in the formal registration systems. The eventual aim of recording de facto tenures is therefore to transfer land documents and data into government holding to allow for official recognition of the tenure rights and for issuance of official documents later on (corresponding to path B in the conceptual scheme of Fig. 1).

Finally, it should be noted that the process elements of surveying and tenure documentation, which we described here separately, are closely related in at least two ways. First, the nature of some land rights does not lend itself to a fixed boundary approach; and hence the aim of documenting the full diversity introduces a tendency towards a general boundary approach. Second, whether general or fixed boundary approaches are pursued also influence official recognition. For example, certificates of customary ownership in Uganda and occupancy licenses in Zambia have been issued following the general boundary approach by STDM, in collaboration with local land authorities. For CaVaTeCo, the only hindrance to the issuance of formal land certificates lies in its use of the general boundary approach, because meeting the accuracy standards for surveying as defined by law is required before formal land

certificates are issued based on CaVaTeCo’s documentation. Landmapp’s use of fixed boundary approach and their cooperation with the formal land authorities during the data capture processes results in the issuance of formal land certificates in Indonesia. In Ghana Landmapp collaborates with both statutory and customary land authorities as both authoritative entities play a role in authorizing both the survey process and the documents (signing of documents) at different stages.

### 3.3. Application contexts

Application contexts also vary between initiatives, not only in terms of geographic or national regions. A basic differentiation is between urban and rural contexts. In urban and peri-urban areas, initiatives focus especially on land tenure documentation of poor and socially disadvantaged groups, and contexts where land tenure documentation coincides with data collection efforts in the course of urban housing and infrastructure development projects. In rural areas initiatives contribute to land tenure documentation in association with cash crop production or for communities to access financial loans for a variety of community level improvements, e.g. in building construction and maintenance; as well as in the management of land in irrigation schemes and monitoring the impact of agricultural development programs for improving farmer productivity. The financial and organizational characteristics of each initiative influence also the application contexts. For example, for-profit initiatives need to find a balance between the aims of land tenure documentation, on one hand, and developing a feasible business strategy, which requires evidence of a market for the offered solutions and/or adjustment of the latter to the market of customers, on the other not-for-profit initiatives do not have to prove financial viability although they are dependent on and accountable to donors. The latter may come to influence application context in the longer run through their expectations. Furthermore, the application focus also depends on the local partners’ financial situation, and in turn dependent on larger donor agencies as expressed by this interviewee:

*“So, we have more or less the security to be stable for a while, but for the local NGOs – as it’s often these small NGOs that are reliant on piece meal funding –, it’s terrible, because they don’t know if they can, are able to start a project - they depend [on whether a given donor] is going to spend money or not”* (representative from Cadasta, 20 April 2017 interview).

Initiatives embedded in organizations of a large reach and relative financial stability also show more diverse application contexts ranging from rural to urban and supporting land rights documentation on part of the communities as well as government, for example STDM and FAO.

In sum, the specific application context is not only guided according to an initiatives longer term vision but has to be flexible and adjusted in response to a variety of factors, which are local as well as global and dynamic in nature. We elaborate more on the challenges that this poses in the next sections.

#### 4. Cross-cutting challenges in implementation

In this section we discuss four challenges, that characterize the implementation process across various initiatives. These are important in that they offer entry points for future implementation and evaluation as well as understanding the nexus between innovation, on one hand, and the existing institutional frameworks of land governance, in which a given initiative works, on the other.

##### 4.1. Digitizing the plurality of land rights

A common trend across the initiatives and relatively independent of their respective process design, business strategy or organizational history and financing mechanisms is that they promote explicitly the *digital* documentation of land tenure. This is important to note, because the digitalization of land documentation adds further complexity to the question of recording land rights in terms of data access, protection, and the need to provide both paper-based documents as well as digital databases to potentially different actors. The reasons for digitalization of land records are more or less explicitly those cited elsewhere in literature on e-government, later open data government and ICT for development (Homburg, 2008; Heeks, 2010; Meijer et al., 2012; Nedovic-Budic et al., 2011), namely speed and ease of data collection, more efficient data management, inclusionary potentials for poor and vulnerable groups, and greater transparency.

The aim of leveraging the promises of digital data technology, is combined with another aim in the case of initiatives to innovate land documentation, namely, to be as inclusive as possible of the plurality of land tenures that exist in many contexts of implementation. During community-based discussions, in liaison with government officials and customary authorities, the promoters of innovative approaches emphasize the need to record a plurality in land rights, including informal and customary land rights, temporary land uses and negotiated access to land, as well as rights as per statutory law. In so doing, especially women's rights and rights of groups that have in past been marginalized from land tenure formalization efforts, are moved to the foreground of discussions and subsequent data collection and documentation efforts. The initiatives all take a community-based approach and work with local civil society organizations and NGOs and advocate for participatory approaches to land rights documentation:

*“It is important to emphasize the importance of the ‘people’ component i.e. getting the buy-in from the stakeholders including the intended beneficiaries, building capacity and bringing out the fact that high-end technological tools and techniques do not always offer the required solution - pragmatic and ‘unconventional’ approaches are key”* (representative from GLTN in written feedback to first paper draft, 11 May 2017).

The adjustments to various application contexts also play a role in the goal of seeking optimal inclusion of diverse types of land tenures. Here, the initiatives adjust (intentionally or not) to the legal pluralist environments they encounter by aligning needs and objectives of the communities in negotiation with other actors, especially government

and customary authorities, who are in charge of legitimizing land tenure records. This approach requires advocacy also for surveying techniques that are less precision oriented than those embedded in administrative procedures. But this is also where a tension emerges – especially where mapping and documentation of land rights are implemented on a parcel-by-parcel basis. Documentation of de facto tenures through piecemeal parcellation is biased towards individualization of tenure rights rather than capturing a full spectrum of legitimate overlapping arrangements as observed by (Hendriks et al., 2018), who emphasize that true reflection of tenure arrangements could provide living laboratories for future legal-administrative innovations. Also, shown in the process description in Section 3.2 above, in order to produce documents that are officially recognized and endorsed by government requires adjustment of the documentation process to government requirements. In this process higher accuracy and a more reduced scope of tenure types can become re-introduced into the process.

However, due to the general vision of community-based rights delineation and data capture, the initiatives act as catalysts in a discursive sense by discussing the role of multiple and sometimes overlapping land rights and the protection of vulnerable groups' rights and land uses. The following quote from a not-for-profit initiative representative expresses both the general vision of documenting diverse land rights, but at the same time struggling with the challenges in gaining official recognition of the initiative's tenure documentation:

*“[W]e need particularly the surveyor general and those [kinds of] people [government surveyors and official administration] to understand to move ... towards a continuum of land rights,... to say, ‘look, other than being stiff when we see we cannot solve this, we need softer ways of solving the problem’”* (representative from GLTN, 14 March 2017 interview).

However, the challenge is not limited to the realm of relations to governmental institutions with respect to land rights recognition. The process of implementation is also influenced by the communities and non-governmental liaisons, whose interests and work context require flexibility.

##### 4.2. Flexibility in process design, flexibility in vision

Because the emphasis in the initiatives rests on working with local communities and various governmental stakeholders across local to national scales, the original visions of the initiatives become adjusted and diversify in the process of implementation. It is not only the original legal pluralist environment, which requires database design and data collection to be flexible, but also the nature of the initiatives themselves, societal visions of involved stakeholders and their short-term interests, as well as the changes in objectives arising from an engagement with a variety of local and global actors, which require a data technology design *“for flexibility to document evidence as defined by users – legal, customary, other”* (representative from Cadasta in written feedback to first paper draft, 15 May 2017).

Therefore, a second common trend across the initiatives is the association between flexibility in process design and data collection, on one hand, and flexibility in terms of an initiative's original visions and aims. This pertains to longer term societal visions, but also in some cases to the initiative's internal visions and philosophy. For example, the common interest in protecting women's lands rights and access to land for vulnerable groups (whichever way these may be defined) hints towards a social justice vision for societal development across the initiatives. At the same time, however, explicitly stated goals to innovative land tenure documentation is economic (especially via dynamic real estate) market growth. Both of these are large-scale, longer term and normative visions for societal development. In practice,

however, these two may not be complimentary. Transparency and openness of governance processes are also large-scale, longer term development goals driving the initiatives, especially in association with the promotion of digital technologies. Here too a contradiction can present itself in practice between the protection of vulnerable groups and their data, on one hand, and the vision of publishing the data to third parties, including large-scale investors, on the other.

Thus, the broader and longer-term visions for societal development are interpreted and translated in practice in different ways depending on a variety of factors, including application context and an initiative's financial and organizational characteristics. For instance, whether an initiative has to make its own profit or not bears an influence. Obviously, for-profit initiatives need to proof viable business strategies and a market of customers for their product. This introduces a de facto differentiation of land rights holders into customers of the certificate and/or data services being offered and those land holders, who do not wish to buy the product or cannot afford the services. In some cases, the change in original aims is quite explicit and fast. For instance, in Landmapp's case the original idea was to support local farmers in recording their land rights in order for the farmers to act as environmental stewards. In this case the original aim combined with the start-up's spirit of entrepreneurship was motivated also by environmental protection concerns and nature conservation. Through the course of time, however, and with the need to develop a customer base and business strategy, the vision changed into objectives driven by local community needs as well as market potentials and feasibility. In Ghana Landmapp now focuses on cocoa farmers to support them to get land documentation, which in turn may be used for accessing loans or other services. In addition, in how far objectives for land tenure documentation become implemented depends largely on the funding situation and financial stability not only of the initiatives themselves, but of their local partners as well. Especially when data collection and database set up are driven by the data needs for a temporary local project, e.g. to gain access to a government provided service, the effort of land tenure documentation becomes (at least temporarily) limited to this context as well.

The following quote illustrates the adjustment process as it highlights several influential factors including also questions of technical feasibility, and in-practice learning on part of the implementers:

*“[My colleague] had been basically working on an idea to crowdsource land right claims, for indigenous communities, rural communities, by empowering them to, basically do that on their own. So, it was kind of build an open toolset, that was the idea at the beginning. And we subsequently learned ... [that] land tenure could be the key in stopping deforestation, and the [...] communities they would protect their land. When I joined it was more from an access to finance perspective for smallholders; and I was trying to find out how you could unlock finance and finally, you know, land documentation is what does that best. And so, yeah, we decided to sort of develop this together. But what we quickly realized within the first few months, that it wouldn't work to just do sort of crowd submitted claims that we could gradually verify over time. ... we found this out by testing”* (representative from Landmapp, May 10 2017 interview).

Across initiatives the aims behind land rights documentation become adjusted depending on implementation context, local and global actor constellations, and associated interests. This also reflects in the types of data being collected. For example, in many cases, data collection is not limited to land tenure data, but includes various socio-economic data depending on the needs of NGOs and the requirements of government induced community development projects. In these cases, land rights related data are collected alongside other information as explained by the representative of one of the for-profit initiatives:

*“I think it's really about how to be intelligent about how you collect the data because you know how many survey teams are going into those communities...And what you want to be doing is a bit more strategic, right? If we are doing health, or if we are doing land – we might as well collect [data on] health and education at the same time”* (representative from Thomson Reuters, Aumentum, 3 March 2017 interview).

In combination, the challenges discussed so far – pertaining to the digitalization of diverse land tenure types and flexible adjustments of the documentation process – combine into a longer-term challenge related to the influence of innovation on the broader land governance scene in contexts of implementation. It is the question of how to legitimize innovation.

#### 4.3. How to legitimize innovation?

Upon documentation of tenure rights, Hendriks et al. (2018) raise concern over the resultant documents in what they term ‘halfway documents’ and call for detailing and linking these documents to the ‘continuum of land rights’ concept. Land tenure documentation interventions create social change, which subsequently could have different impacts on local politics and social norms’, and yet managing the cultural and political shifts in communities is an often neglected component of tenure formalization (Barry, 2018; Wily, 2008; Meitzen-Dick and Mwangi, 2009). Even in the context of FFP approaches for LA, Barry (2018), calls for attention for development of strategies on how “socio-cultural norms and power relations [will] need to be changed for the new land certificates to deliver their intended benefits to community members, as well as contribute to the expected development outcomes”.

In line with this we observed a general challenge encountered by the initiatives. It is the question of how, when and by whom both the analogue documents as well as the digital data are considered legitimate and for what purposes they can be legitimately used. Initiatives approach this issue in different ways, for instance by adjusting to existing formal administrative requirements for data collection and required content of documents, or by enrolling both community level and other land sector authorities early on in the process.

One (discursive) reaction by the implementers to the political relevance of and potential contestations in land documentation is what we might call “avoidance of the legitimacy question.” By this we mean that an initiative may position itself explicitly as external to land governance processes and policy making and to emphasize its focus on specific, temporarily bounded project needs. For example, the interviewees from Thomson Reuters's Aumentum Open-Title explained that their initiative has moved out of the land governance and policy making domain and positions itself strictly as an IT solution provider. Cadasta and Landmapp representatives emphasized on being cautious not to engage in land litigations and situations of contestation or conflict. GLTN emphasized adherence to its own, GLTN's - and more broadly, UN's - values and principles.

This is not to say, however, that implementers are not aware of the political nature of their projects as expressed in this reflection on a documentation project in West Africa:

*“I mean we have to be aware of that and I think you try and work your way through the most appropriate approach based on all these different competing interests”* (representative Thomson Reuters, Aumentum, 3 March, 2107 interview).

What is then important for future research and implementation is to document and understand which and how documents gain legitimacy and on the basis of whose arguments and procedures, also if the documents do not become officially endorsed by the government. Similar questions can be asked about the digital data produced during

tenure documentation. And here a fourth challenge exists, namely, how to strike a good balance between transparency of land tenure and transactions and protection of people, places and land. In other words, the question is, how to be responsibly open.

#### 4.4. How to be responsibly open?

Promoters and developers of innovative tools advocate strongly for openness of land tenure information for various reasons, for instance decision making by third parties, but also to increase transparency of the land sector for the benefit of vulnerable groups, who have difficulties in accessing government information and are hit hardest by opaque land deals. Openness has different meanings to the people we interviewed, but also to different communities, with whom implementers work. Many of these meanings have a positive connotation referring to efficiency due to sharing of data for different purposes, cost savings, because of use of open source technology and free licensing and pricing mechanisms, the ability to include local knowledge in governance processes by opening up “mental maps” of local community members, openness in terms of updating data regularly, if not continuously; and importantly the aim of creating a transparent land governance regime, where openness means improved access to information especially for less powerful and vulnerable groups of society.

However, the ideas of “openness” and “open data” are met with many challenges. What matters here is, who gains access and for what uses of data considering local sensitivities and needs regarding the types of data being collected. Especially the FAO representative emphasized differing local sensitivities towards the idea of “openness,” for instance, among indigenous communities, who do not wish to see the location of sacred places exposed. In these cases secrecy and place knowledge held by only special members of the community constitute the very essence of sacredness and as such stand in fundamental contradiction to the paradigm of openness and transparency in information. In FAO’s initiatives the term “OpenTenure” created a lot of discussion and concern among local communities; and the organization has considered changing the name of the approach:

*“So when you go in the field you have also to agree and to inform about the terminology e.g. when we say OpenTenure ... we had a workshop in Guatemala and they asked ‘what’s open’ what’s tenure?’ So you also have to tailor your language, terminology so to agree on the meaning of that single word. This is important. In fact we are working on this name actually, because it is confusing. The open was intended, because it is an open source system. And it is also open, because it is open to the use by communities who are not yet empowered. So in that sense it is open... But still it can cause ambiguity and confusion. So we were thinking to change that name.”* (FAO representative for OpenTenure initiative, 19 April 2017 interview).

Similarly challenging are discussions with local stakeholders regarding the nature of technologies in relationship to data storage, sharing, and publication. For example, cloud storage, used by many of the initiatives, is problematic to explain to land holders. Landmapp has prepared charts and sketches of how “the cloud” works for purposes of explaining the technology to farmers, for instance. At the same time, it is important to remember that understanding how the so called cloud functions is by no means a challenge only for farmers, but a formidable challenge even to network engineers (Hu, 2015).

The issue of privacy in the context of open data also gains a more complex meaning beyond individual rights as it relates to the socio-economic networks of people as expressed in the following note by the representative of an initiative that leverages German data privacy laws in choosing server locations:

*“Land documentation, I think, generally per definition, is, uhm, public domain data...So, the data that we consider private is actually much more: it’s socio-economic data – how many children do you have, are you married, what are your income streams, how old are you – all this kind of stuff, cause that is much ... more risky, to put out there; and then their [farmers’] production data, which is pretty much 90% of their income ... and there is huge social risk in sharing how much income you have. So, this is very private”* (representative from Landmapp, 10 May 2017 interview).

In this respect, changes in types of data collected, flexibility in database design and collection as described above merge with concerns about which of the various types of data to share, not only with whom. Because of these questions, STDM opted for community-based database storage, which however, poses its own challenges in that it requires additional capacities at community level.

## 5. Conclusion: considerations for future implementation

The initiatives we reviewed in this paper are innovative in the land tenure documentation not only in the sense that they use new technologies, e.g. mobile apps for surveying, but also in that they seek to transform land documentation from a government driven domain to a more community driven endeavor deriving from specific needs and purposes of a locality. In how far these seeds of innovation will upscale to transform land documentation processes and land governance institutions at a larger scale remains to be seen. In addition, these initiatives introduce new actors and data links, which stretch, at least partially, far beyond a “locally circumscribed context.” A few points for implementation and evaluation efforts in future can be made based on the preceding review of characteristics and related challenges.

Based on the review in Section 3 of this paper, we would expect that financial, organizational and application contexts will influence differently the dynamics between land holders and land governance institutions in various contexts. For example both financing mechanism and application context influence who will participate in mapping and who receives different kinds of tenure documents. The participants may be viewed and treated as customers, as beneficiaries of a government project, as members of a community with similar rights to a portion of land, or as clients and end users of a data service. These perceptions are important to note and to differentiate in future analysis, evaluations and discussion as they allow for a better understanding of the role of innovative approaches within the broader institutional landscape in different contexts and how the latter changes or not in response.

Section 4 of our paper provides a basis for future considerations. Each challenge identified here points to specific questions for implementation and evaluation in the future. First, we identified the challenge of digitizing the plurality of land rights. While none of the initiatives actually record all overlapping land tenure rights in every possible situation and need to adjust to existing administrative workflows and procedural survey requirements in order to produce officially legitimate documents in many cases, they do act as catalysts in discussing the role of multiple and sometimes overlapping land rights and the use of faster and easier technologies for land tenure documentation. One rather empirical question here is what types of tenure and rights are being written into the database and onto documents by various initiatives and in how far does such inscription influence back onto the normative geography of land use and access rights in the longer run. Another more theoretical question, but relevant for implementation and evaluation, is how to strike a good balance between the need to adjust to existing institutional requirements, on one hand, and how to develop innovative, but also financially feasible and socially responsible processes to record land tenure rights at scale, on the other.

Second, in Section 4.2 we discuss under the label “Flexibility in process design/flexibility in vision” how the initial aims of the initiatives become adjusted and diversified in the process of working with various stakeholders and their respective aims and interests. This is important to take into consideration in the evaluation of the initiatives’ outcomes both in the shorter and longer term. The stated aims at the beginning of implementation may not suffice for an assessment at a later point in time. A practical recommendation for implementers here is to document the process of implementation across different contexts to provide a basis for sustained analysis across time rather than only relying on a before-and-after quantitative assessment of output (e.g. in the form of final total number of documents issued). This would provide opportunities for the initiatives to develop context-based process designs for tenure documentation based on their experiences, in order to inform and support future work. The flexibility challenge we describe in Section 4.2 raises at a more conceptual level the question of purpose. The flexibility to adjust aims to local context is important as it could provide the opportunity to develop theories, design elements and implementation strategies for varied local situations (Hendriks et al., 2018). Such theories, design elements and contextualization may help predict what Barry (2018) terms “Critical Success Factors” (CFS) for tenure documentation initiatives to work where future tenure documentation interventions are contemplated. Contextualization of the approaches and respective factors with consideration of the preconditions and practices applicable before, during and after could act as guiding frameworks for these tenure documentation approaches (Booth et al., 2016; Harris and Booth, 2013). In short, nuanced research and evaluation would be as if there are certain types of purposes and circumstances, for which a given approach is fit in future.

The third challenge discussed in Section 4.3 relates to the issue of legitimacy of documents and in extension to the legitimacy of process (e.g. actors, technology) through which the documents are created. Tackling this issue in practice also requires longitudinal engagement by both implementers and researchers to explore the various purposes that both documents and digital data are deployed for. In other words, we need to ask not only fit-for-what-purpose, but for whose purposes and at what point in time? Here, the process of upgrading the resulting documents to official recognized tenure certificates is a gap that needs to be addressed. Whose responsibility should that be? What are the procedures to follow, and at whose cost? At the same time, we also need to learn, what happens with the documents that are being issued not only on the side of the government, but also in terms of different uses by the holders of the documents. For example, as one anecdote from an interviewee illustrates, a document may not be considered a legitimate proof of a person’s or group’s tenure right by government or large international banks, but it may well be accepted as a proof of identity and asset by local loan agencies, who then provide financing on the basis of these documents. If this money is used to finance construction, de facto tenure rights may be gained indirectly via the documents in contexts where statutory laws exist that acknowledge construction as a means to claim land rights. In this case the use of the document at local scale via loan and construction would strengthen officially legal tenure recognition despite the lack of official endorsement of the document or formal registration. The same questions posed with respect to paper documents being issued apply to the uses of the digital data, which may or may not be produced in the process of tenure documentation. And this leads to the final point for consideration in the future implementation and evaluation of the initiatives.

## Appendix A

The final points here are based on the discussion in Section 4.4 “How to be responsibly open?” Land tenure documentation, whether through digital or analogue technologies, whether carried out by government or on community basis, always entails the drawing of boundaries. This process is not only a technical question, but one that is closely linked to the governance of society and nature-society relations; and the uses of land and related resources are tightly knit into the associations between governmental and non-governmental actors (Meinzen-Dick and Mwangi, 2009). With the use and promotion of digital data technologies, matters become arguably more complex as land tenure data can now be shared much faster and at greater distances at a global scale. Concerns regarding data and privacy protection, potential misuses and unanticipated uses of data, and the risks of visibility and commercialization of people’s data in the context of development (Heeks, 2016; Taylor, 2017) have recently found (renewed) resonance among the land surveying community (Georgiadou, 2017). Land tenure related data is highly sensitive. And yet, the arguments for transparency and openness of land data cannot be discarded. The initiatives we have described here, have begun to discuss and tackle these concerns in different ways ranging from communication with local communities about data storage to organization internal discussions about the choice of server locations to host data and services. Finding a just balance between openness and protection – of people, land and related data – will continue to be a significant concern in endeavors to innovate land tenure documentation by use of digital technologies. A scaling up of initiatives in terms of services, areas, and actors would coincide with an increase in data quantities and types, for which organizations are responsible if they become positioned as nodal points in new digital data flows and networks related to land governance. If, on the other hand, initiatives become abandoned, merge, or otherwise transform in organizational and financial network terms, the question is, what happens to the digital data that has been collected? This is an important question, especially for those initiatives that position themselves as “IT solution provider,” “consumer data company” or “data service provider” while at the same time, in practice, taking on tasks that are conventionally those of statutory and customary governance institutions. In short, sustainability of organizations and their respective responsibilities in data publication, uses, and protection are important future considerations.

In the final instance, in combination these considerations are important to address in future implementation and evaluation as they will influence the degrees and types of land tenure security that can be achieved, as well as whose tenure security and rights at different scales, localities and points in time.

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**Table A1**  
An overview of six innovative approaches for tenure documentation.

Initiative	Funding	Process design	Owner /organization	Tested/ Implemented	Application Context
[* indicates the 6 initiatives that we interviewed and included in analysis]					
<b>*STDM (Social Tenure Domain Model)</b> <a href="https://stdm.gltm.net/">https://stdm.gltm.net/</a>	Not for profit donor funded external funding for specific components of the tool	Captures de facto/social tenure along the continuum of land rights Based on open source software	GLTN, UN Habitat in Kenya	<b>Africa:</b> Kenya, Uganda, Zambia, Angola, DRC, Sudan and Namibia <b>Asia:</b> Philippines, Nepal Middle East: Iraq <b>Latin America:</b> Colombia, Trinidad & Tobago, St. Vincent and St. Lucia <b>Africa:</b> Uganda, Nigeria, Sierra Leone, Angola <b>Asia:</b> Cambodia, Myanmar <b>America:</b> Guatemala	Recording land rights of urban (e.g. slums and municipal administration), rural communities (e.g. customary occupancy certificates, monitoring farmer productivity), and in post-disaster/conflict contexts for future upgrading along continuum of land rights and for access to other services
<b>*OpenTenure (part of SOLA family)</b> <a href="http://www.flossola.org/index.php/solutions/Open-tenure">http://www.flossola.org/index.php/solutions/Open-tenure</a>	Not for profit donor funded	Captures de facto/social tenure Based on open source software	FAO in Italy	<b>Africa:</b> Nigeria, Sierra Leone, Lesotho <b>Asia:</b> Nepal <b>Oceania:</b> Tonga, Samoa <b>Africa:</b> Nigeria	Supports governments in managing land tenure data, community recognized tenure rights/ claims
<b>SOLA Registry (part of SOLA family)</b> <a href="http://www.flossola.org/index.php/solutions/registry">http://www.flossola.org/index.php/solutions/registry</a>	Not for profit donor funded	Adapts legal workflows for tenure registration Based on open source software	FAO, Italy	<b>Africa:</b> Nigeria, Sierra Leone, Lesotho	Provides enterprise wide support for registration and cadastral functions in a typical district land office including case management of applications
<b>SOLA Systematic Registration (part of SOLA family)</b> <a href="http://www.flossola.org/index.php/solutions/systematic-registration">http://www.flossola.org/index.php/solutions/systematic-registration</a>	Not for profit donor funded	Adapts legal workflows for tenure registration Based on open source software	FAO, Italy	<b>Africa:</b> Nigeria	Designed to support first registration through systematic adjudication & registration
<b>SOLA State Land (part of SOLA family)</b> <a href="http://www.flossola.org/index.php/solutions/state-land">http://www.flossola.org/index.php/solutions/state-land</a>	Not for profit donor funded	Captures de facto/social tenure Based on open source platform and tools	Headquartered in Washington, D.C. with employees remotely based in Europe, North America)	<b>Africa:</b> Kenya, Nigeria, Tanzania, Mozambique, Zambia, DRC <b>Asia:</b> India, Bangladesh, Nepal, Indonesia <b>Latin America:</b> Dominican Republic, Colombia, Honduras, Haiti <b>North America:</b> USA <b>Europe:</b> Kosovo	Develops and promotes the use of simple digital tools and technology to help partners efficiently document, analyze, store, and share critical land and resource rights information. Cadasta supports flexible data schemas per partner/project, so they can be adapted to the specific needs of the context (urban or rural, household surveying or community profiling, agriculture or community planning).
<b>*CaVaTeCo</b>	Not for profit – donor funded	Adapts legal workflows for tenure registration and development of land use (change) documentation processes Based on open source platform and tools	Terra Firma, Mozambique	<b>Africa:</b> Mozambique	Aims to record the land owned by the state with specific issues related to state land
<b>*Landmapp</b> <a href="http://www.landmapp.net/">http://www.landmapp.net/</a>	For Profit	Adapts legal workflows for tenure registration Based on commercial/proprietary software and services	Landmapp, – the Netherlands	<b>Africa:</b> Ghana <b>Asia:</b> Indonesia	Recording of land tenure rights at levels of community boundaries, and within these boundaries at individual/family parcels are drawn. Existing land uses are also mapped, including anticipated land use changes in the near future – obtained through participatory mapping. Tenure information is overlaid with future community land use plans, an approach that reveals any unused or underutilized spaces. Pockets of underused spaces are used to engage in dialogue with potential large-scale investors.
<b>*Aumentum Open-Title</b> <a href="https://tax.thomsonreuters.com/aumentum/OpenTitle/">https://tax.thomsonreuters.com/aumentum/OpenTitle/</a>	For Profit	Captures de facto/social tenure Based on commercial/proprietary software and services	Thomson Reuters – USA	<b>Africa:</b> Ghana, Liberia <b>Latin America:</b> Bolivia	Focus on land tenure documentation for smallholder farmers, peri-urban residential landholders – individual – e.g. for access to loans  Configured to support different project requirements; Ghana, issuance of paralegal titles as part of a micro-finance loan offering to schools (loans supported construction and the procurement of learning materials), Liberia, securing paper archives (scanning)

(continued on next page)

Table A1 (continued)

Initiative [* indicates the 6 initiatives that we interviewed and included in analysis]	Funding	Process design	Owner /organization	Tested/ Implemented	Application Context
<b>MAST</b> <a href="https://www.land-links.org/tools-and-mission-resources/mobile-apps-to-secure-tenure-mast/">https://www.land-links.org/tools-and-mission-resources/mobile-apps-to-secure-tenure-mast/</a>	<ul style="list-style-type: none"> <li>● Not for profit Donor funded</li> </ul>	<ul style="list-style-type: none"> <li>● Semi-crowd sourced methodology</li> <li>● Based on open source software</li> <li>● Adjustable to follow legal workflows</li> </ul>	USAID	<b>Africa:</b> Tanzania, Zambia, Burkina Faso	the national Deeds registry; Bolivia, documenting rural tenure rights in target communities Support of government in recording land rights in a simpler and more affordable manner and land right simply and affordably
<b>MEDEEM</b> <a href="http://medeem.com/parcelcert.html">http://medeem.com/parcelcert.html</a>	<ul style="list-style-type: none"> <li>● For Profit</li> </ul>	<ul style="list-style-type: none"> <li>● Adapts legal workflows for tenure registration</li> <li>● Based on commercial/proprietary software, including services</li> </ul>	MEDEEM Zambia	<b>Africa:</b> Zambia	Smallholder farmers, and the economically disadvantaged to promote more equitable access to the land tenure formalization
<b>INNOLA Solutions</b> <a href="http://innola-solutions.com/">http://innola-solutions.com/</a>	<ul style="list-style-type: none"> <li>● For profit</li> </ul>	<ul style="list-style-type: none"> <li>● Adapts legal workflows for tenure registration</li> <li>● Collaboration between open source and commercial software</li> </ul>	INNOLA Ukraine & USA	<b>Asia:</b> Armenia, Uzbekistan, Azerbaijan, Georgia, Qatar, Pakistan, Ukraine, North America, USA Latin & S. America Jamaica, Bahamas, Nicaragua, Puerto Rico <b>Africa:</b> Egypt, Zambia, Uganda, Nigeria,	Working for clients i.e. USAID, World Bank, MCC and numerous public and private sector organizations.

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