

Disruption or Déjà Vu?

Digitalization,
Land and Human Rights

Case Studies from
Brazil, Indonesia, Georgia,
India and Rwanda



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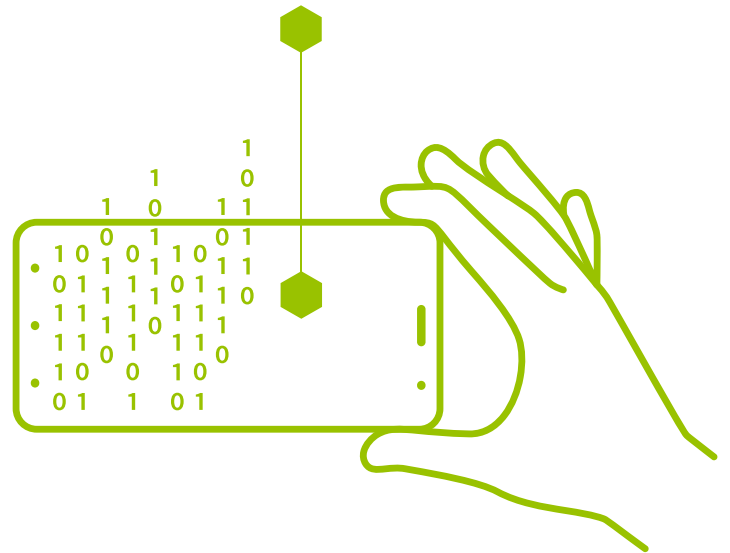


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Key Findings

1. DIGITALIZATION IN THE CONTEXT OF LAND IS WELL UNDERWAY

There are a number of ongoing initiatives, processes and projects around the world pushing digitalization in the context of land. Although a great deal of attention has been given to the use of blockchain technology, this is only a small part of the story, and most blockchain projects are stalled or still in the initial phase. There is an impressive amount of big projects funded by international agencies and institutions that are currently being rolled out in several countries, especially in the Global South. However, land-related digitalization processes also unfold in countries that are not targeted by highly funded projects. Overall, there is a strong focus on land administration (digital mapping, digital registries and cadasters, digitized land transactions, etc.). The stage of these initiatives varies considerably: some projects have only been announced or are in the initial phase, while others are mostly implemented and applied.

2. LAND-RELATED DIGITALIZATION PROCESSES HAVE CONCRETE IMPACTS ON TENURE AND HUMAN RIGHTS, AND LONGER-TERM IMPLICATIONS ARE FORESEEABLE

Digitalization in the context of land is already having a concrete impact on land governance and the rights of people and communities. The analysis of initiatives in Brazil, Indonesia, Georgia, India and Rwanda show how land-related digitalization processes replicate, foster, and even exacerbate, discrimination against and marginalization of rural people. In addition, the analysis points to longer-term implications that may further entrench tenure models based on exclusive, private ownership and land markets, at the expense of other forms of tenure – in particular, collective and customary tenure systems – and more equitable distribution of land.

3. DIGITALIZATION PROCESSES ARE ROLLED OUT WITHOUT INCORPORATION OF HUMAN RIGHTS

Despite their important consequences for tenure governance, land-related digitalization processes do not adequately take into account human rights and the associated international standards. Initiatives are carried out without prior assessment of human rights impacts and have no adequate monitoring provisions to ensure accountability.

4. DIGITALIZATION IS NOT A SHORTCUT TO ADDRESSING CRITICAL TENURE ISSUES

Despite a lot of talk about ‘disruption’ and the potential of ‘leapfrogging’ in debates around digitalization, ongoing initiatives encounter the existing ‘old’ structural tenure issues such as land concentration, lack of effective protection of collective tenure rights and systems, corruption, etc. The analysis of digitalization processes in Brazil, Indonesia, Georgia, India and Rwanda show that initiatives do not address such problems. In several cases, they replicate and amplify existing forms of dispossession, create new forms of exclusion and foster land concentration. Land is a deeply political issue and the use of digitalization processes technologies does not transform into a technical one. Consequently, digitalization processes cannot replace human rights-based tenure policies.

5. DIGITALIZATION FOSTERS MARKET-BASED APPROACHES TO LAND AND TENURE GOVERNANCE

The analysis of land-related digitalization processes in five countries shows that initiatives are inherently designed to make land ‘investible’ and attractive as a financial asset. All processes – either explicitly or *de facto* – put a strong emphasis on the promotion of land-related investment projects, the facilitation of land transactions and the promotion of land markets. In particular, our analysis points out that digitalization processes foster a land regime that is biased towards private, exclusive ownership. In many cases, other forms of tenure and use are not only

overlooked, but *de facto* erased, especially collective, customary forms of land management and tenure systems. This entails a significant reconfiguration, or even redefinition, of ownership rights.

6. DIGITALIZATION LEADS TO AN INCREASING ROLE OF PRIVATE COMPANIES IN LAND GOVERNANCE

Corporations play a key and critical role in collecting land-related information, storing data, providing the technologies and digital infrastructure, and even in delivering services. The research indicates that land-related digitalization leads to a transfer of public sector roles from the state to the private sector and is linked to a surge in public-private partnerships (PPP). Such arrangements blur the line between public and private actors, raising serious concerns around accountability and sovereignty.

7. DIGITALIZATION REQUIRES AND ENCOURAGES SIGNIFICANT CHANGES IN POLICY AND LEGAL FRAMEWORKS

Depending on their scope, many land-related digitalization processes require significant changes in existing land legislation. Several of the analyzed countries are in the process of developing new legislation, ranging from administrative provisions to changes in civil codes, in order to fully roll out digitalization. Such changes typically do not focus on addressing critical tenure issues, but the creation of an enabling environment to allow for the use of digital technologies.

8. DIGITALIZATION PROCESSES ARE IMPLEMENTED WITH A SEVERE LACK OF PARTICIPATION

The research shows that there is very little knowledge about land-related digitalization processes among the public in the affected countries, especially among rural people and communities. The analyzed cases point to a top-down implementation, thus reinforce existing structural discrimination and inequalities. Moreover, participatory processes for the design and monitoring of digitalization processes are virtually non-existent.

9. BOTTOM-UP INITIATIVES ARE THERE BUT FACE STRUCTURAL BARRIERS

In some of the analyzed countries local people and communities, as well as civil society organizations, are experimenting with the use of digital tools to assert their rights. One important approach is participatory mapping of community lands. Such initiatives could provide a basis for digitalization processes that respond to the needs of people. However, structural impediments (such as the 'digital divide', structural discrimination, power imbalances, etc.) and lack of recognition of community-based mapping prevents these initiatives from shaping digitalization processes.

10. DIGITALIZATION NEEDS TO BE EMBEDDED IN HUMAN RIGHTS

There is an urgent need to base land-related digitalization processes on human rights, building on existing international standards in this regard. This requires embedding them in tenure policies that address structural discrimination and marginalization of rural people, effectively protecting collective and customary forms of tenure, and promoting equitable access to, and distribution of, land and related resources. Initiatives further need to be developed and implemented through participatory processes, to ensure the effective and meaningful participation of marginalized groups. It is critical that human rights are also at the centre of policies related to the development and use of digital technologies in general (digital economy) – to make sure that they respond to the needs and aspiration of the people.

Land governance is a growing area for the application of digital technologies.

I. Introduction

Digitalization, which refers to the adoption and use of information and communications technologies (ICT) and artificial intelligence (AI) in different sectors and everyday life, is currently being promoted by governments, international institutions and the corporate sector as a new ‘silver bullet’ that is supposed to make governance, public services (‘e-government’) and businesses faster, cheaper, and more efficient. Land governance is a growing area for the application of digital technologies, and considerable, ongoing, global efforts aim at scaling up their use. Collecting geospatial data, mapping lands with digital tools, recording and storing data in digital databases and registries, and using digitized data and digital platforms for land administration, transactions and services are some of the ways in which digital technologies are used in the context of land. Several efforts are also underway aiming at applying blockchain technology to land, which is promoted as a new way of storing land administration data, and automating forms of land transactions.

Digitalization in the context of land governance is promoted as a way to increase transparency, efficiency, tenure security, and to protect against fraud and corruption, thus providing important benefits to all, including marginalized rural people. Such potential contributions to the improvement of land governance and administration need to be carefully weighed against risks, such as a further worsening of existing unequal patterns of access to and control over land and other natural resources by the rural (and urban) poor. Processes of implementation as well as the social, political and economic context are important factors that determine whether the use of digital technologies in the context of tenure will be beneficial or harmful. From a human rights perspective, it is crucial to note that digital technologies are often applied in a context of structural inequalities and discrimination, as well as increasing commodification and financialization of land and nature.¹ Little research has been done so far on the actual impacts and implications of land-related digitalization processes, in particular for affected people and communities. This research paper intends to look deeper into such processes and to offer a preliminary analysis from a human rights perspective – a perspective that is largely missing in the current debates on digitalization.

The analysis and findings presented in this paper are the result of a research process that aimed at providing an overview of ongoing land-related digitalization processes and at identifying their impacts and risks, with a particular emphasis on marginalized people and groups. Applying a human rights lens, the research focused on understanding how digitalization is happening in the context of land, in terms of key actors, dominant narratives, (short-term) impacts, and (longer-term) implications. It also sought to identify how rural populations and communities perceive and react to such processes and what initiatives and strategies exist to shape digitalization processes in a bottom-up way. Key questions of the research included: Does the application of digital technologies strengthen or undermine the rights of small-scale food producers, local communities and marginalized groups? Does it reduce or deepen existing inequalities and injustices? To what extent are digital technologies driving the transformation of land, fisheries and forests into globalized assets? Under which circumstances can digitalization in the context of land support the realization of the right to land of peasants, indigenous peoples and other people working in rural areas?

The paper begins with a brief overview of ongoing land-related digitalization processes as well as relevant concepts, actors and dominant narratives. Based on this framing, the paper then clarifies the relevance of human rights in this context. The third chapter contains short case studies of processes in five selected countries,

which have been selected according to the following criteria: geographical diversity; existence of relevant digitalization process at an advanced stage; availability of information; and diversity of approaches, including the technology used (e.g. blockchain or other technologies) and the way in which the process is implemented (donor-funded project/initiative or not). The case studies are then analyzed in light of the *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests* (henceforth referred to as Tenure Guidelines)² as well as other relevant human rights standards. Based on this analysis the paper closes with a set of recommendations on how to ensure that digitalization in the context of land supports the realization of human rights.

The authors hope that this paper can contribute to ongoing efforts to improve the governance of tenure in support of the rights, needs and aspirations of rural (and urban) people and communities. It is meant to serve as a basis for further discussions on digitalization in the context of land within state authorities and development agencies, but particularly also as an input to discussions within peasants', indigenous peoples' and other rural people's organizations and movements.

II. Digitalization and Land Governance: Developments and Concepts

1 | DEVELOPMENTS, ACTORS AND NARRATIVES

Digitalization in the context of land governance refers to the collection, processing, storage and use of digital information related to land and other natural resources. The use of digital technologies and tools in land governance has been scaled up over recent years across the world. It is currently being pushed particularly throughout the Global South, in the context of the 'modernization' of land administration systems, often in tandem with major land registration and titling programmes. This agenda has emerged as a central component of development strategies since the early 1990s, when the World Bank alone committed more than USD 1 billion over two decades for the digitalization and modernization of land management systems in former socialist countries in Eastern Europe and Central Asia.³ Similar efforts are now underway across sub-Saharan Africa, Latin America as well as South and Southeast Asia. Funded with considerable resources by international financial institutions, such as the World Bank and regional development banks, as well as development cooperation agencies, digitalization is an integral part of such programmes.

A mapping of current⁴ land-related digitalization projects in countries classified as low or medium human development (based on the United Nations Development Program's Human Development Index) identified at least 29 major projects with the focus on setting up digital land management systems (often a part of land titling programmes) in over 20 countries, mostly in Sub-Saharan Africa as well as South and Southeast Asia. The commitments by international donor agencies and governments for these projects exceed USD 1.3 billion. Most of the funding – around USD 1 billion – comes from the World Bank, with nearly 90 per cent of it provided as loans (see table in Annex 2).

An analysis of these projects shows that the main focus lies on replacing ostensibly 'archaic' paper-based land registries and cadasters, and transitioning to the

Digital tools are used to collect enormous amounts of land-related data.

Digital land management systems are usually designed to significantly ease processes around land transfers (purchases or leases), to allow its use as collateral for loans and to improve access to reliable data about land for investors, such as agribusiness companies, real estate developers, investment funds, etc.

digital age – either gradually or through so-called ‘leapfrogging’ – by establishing all-digital land administration systems. Such a process of ‘going digital’ entails the use of information and communication technologies at different levels. Firstly, digital tools are used to collect enormous amounts of land-related data. This refers to very location-specific information (such as soil quality, production outputs, water access, forest cover, rainfall patterns, land price developments, etc.), which is happening under the banner of ‘digitalization of agriculture’ and led by transnational agricultural machinery companies (John Deere, AGCO and CHN) as well as big tech corporations. In the context of land governance and administration, it also refers to the identification and demarcation of lands and forests with digital tools, such as handheld GPS devices as well as high-resolution satellite or aerial imagery (with drones). This creates a huge amount of geospatial data which is the basis for digitized land administration.

Secondly, all this digital information is then stored in digital databases, registries, cadasters and platforms. This digitalization of land administration data entails the scanning/transformation/transcription of analogue records (mainly paper-based, such as notarial acts, land titles, etc.) into digital information, as well as the inclusion of newly collected information into digital databases. Moreover, cadasters and mapping agencies are increasingly equipped with digital tools and use geographic information systems (GIS) applications to store, analyze and visualize spatial data and to layer together land rights and land use information. The last step then is the actual use of the digitized information and the digital platforms/registries for land administration and land-related decision and policy making more generally. This is when information in digital registries is used for proof of ownership, as a basis for resolving land disputes, to carry out land transactions, and the definition of land policies, among other uses. In some countries, projects aim to set up fully interoperable digital land administration systems and web-portals to share information across departments, agencies, the public and private sector, and provide a range of land services online.

It is important to note that land-related digitalization processes are usually embedded in programmes and policies that aim at promoting land-based investment projects and land markets. Indeed, digital land management systems are usually designed to significantly ease processes around land transfers (purchases or leases), to allow its use as collateral for loans and to improve access to reliable data about land for investors, such as agribusiness companies, real estate developers, investment funds, etc. In practice this means advancing and promoting land regimes that are based on exclusive, private ownership. Proponents of digitalization in the context of land claim that digital land titles and land registries increase tenure security for the poor and marginalized, thereby ‘unlocking’ investments in land. A direct link is made between digital land registries and improved access to credit for the population.⁵ According to this approach, which is a new version of theories around the benefits of land titling that shaped market-based land policies in the 1990s⁶, the (rural) poor, who lack the capital to invest in their land, can now collateralize it to access credit, or else transfer the land to ostensibly more productive users. In such a view, combining detailed information about soil quality, water availability and land use in a specific location, with cadastral data provides new tools to make sure that lands can be easily transferred to the most ‘efficient’ users. Consequently, and as the case studies contained in this paper show, collective and/or customary tenure rights and systems are rarely, if at all, contemplated in digitalization projects.⁷

The increased digitalization also entails a push for the (partial) privatization of land-related services, in particular in the form of public-private partnerships (PPPs). According to proponents, the new tech solutions are a way of overcoming land administration problems, such as inefficiency and corruption. At the same time, they pose new challenges for under-resourced public administrations in the Global South, which the private sector is supposedly in a better position to handle.⁸ The

Millennium Challenge Corporation, a US bilateral aid agency and important donor in the land sector, explicitly and actively advocates for PPPs in land administration⁹¹⁰, and initiatives to (partially) privatize land registries or related services have already taken place in the Philippines; Karnataka and Maharashtra, India; and Kuala Lumpur, Malaysia.¹¹ The World Bank recently conducted an extensive framework analysis¹² of PPP-solutions for land administration and conducted a series of global consultations with governments and the private sector on the issue.¹³

Even though this paper will focus on digitalization in the context of land administration and governance, it is crucial to take into account the broader context of digitalization. This means, firstly, that key issues of the digital economy, such as the private nature of most digital infrastructure, a highly concentrated ICT sector as well as geopolitical issues (some observers speak of a new, digital colonialism) need to be taken into account.¹⁴ Secondly, there are critical questions regarding the ownership of data and their use, including questions on who may use data and for what purposes. This relates to the data contained in the land registries as well as the ‘non-personal data’ that is related to land quality, use, etc., and which is collected through sensors, tractors, satellites, etc. (in the context of e-agriculture), and which is, or could be, combined with the cadastral information/data. Thirdly, key issues such as the location of the data, clouds and servers, and where it is stored and processed are highly relevant in the context of governance, as they raise critical questions related to public control and sovereignty over data and digital infrastructure.¹⁵ Consequently, digitalization processes that are not directly (or explicitly) linked to land administration or governance can have important impacts on land tenure and connected rights.

2 | BLOCKCHAIN TECHNOLOGY IN LAND ADMINISTRATION – HYPE OR REALITY?

One digital technology that has received a lot of attention in recent years is blockchain. It received considerable media attention as the technology underlying cryptocurrencies, such as Bitcoin, and is often presented as a ‘disruptive’ technology, which can serve as a sort of silver bullet for (almost) every problem. There are, however, also increasingly critical voices, especially regarding the practical application of the technology in different fields as well as its extremely high energy needs and consequent increased environmental impact.¹⁶

In the context of land, blockchain technology has been argued as having the potential to ‘revolutionize’ land management, to end corruption, fraud and mismanagement.¹⁷ According to proponents, it provides a transparent and tamper proof way to manage land records and/or expedite land transactions. Blockchain is a decentralized, distributed database that packages records of transactions or values into encrypted blocks and sends them across a (public or private) peer-to-peer network. Each data block contains a digital signature (hash), timestamp and a reference to the previous block, creating a growing chain of immutable records. This is said to make it impossible to add, delete or change data without being detected by other network members.

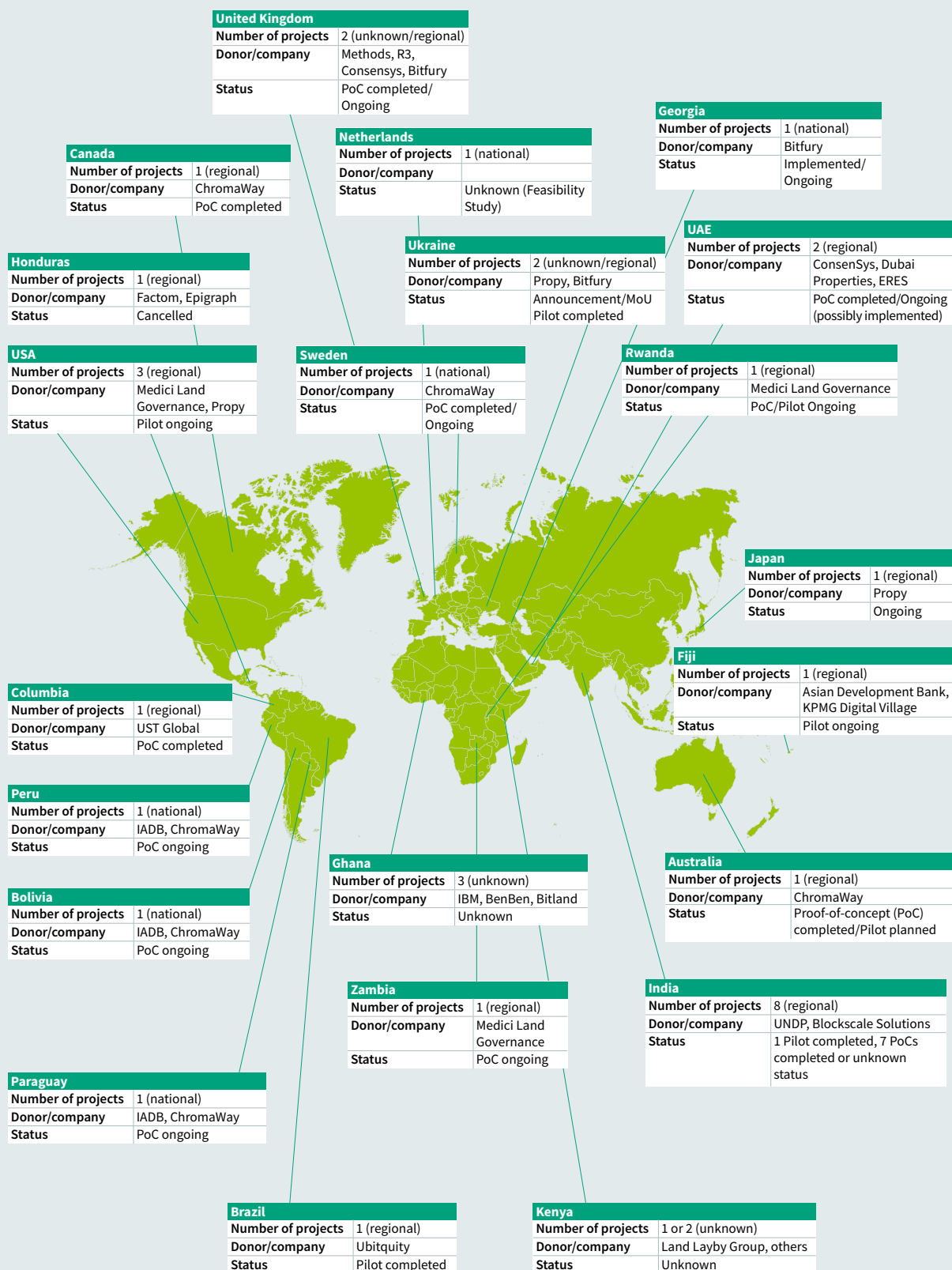
On a basic level, blockchain technology can be used as a back-up or add-on to a conventional central land registry database, providing an additional security layer by adding a hash/digital fingerprint to a title or lease agreement and place the hash on a public blockchain so it is “virtually notarized and publicly recorded”.¹⁸ A more sophisticated approach replaces, or more closely integrates, the central land registry database with a (private or permissioned) blockchain to store the actual land records on it.¹⁹ A third option tested in some countries is to use the blockchain technology to facilitate land transactions using so-called ‘smart contracts’. These are computer programmes running on a blockchain that self-execute certain terms of an agreement when defined conditions are met. With the help of smart contracts

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Blockchain for Land Administration and Land Transactions

Majority of Projects have not moved beyond Planning or Proof-of-Concept (PoC) Stage



See Annex 2 for more details about the projects

(aspects of) land transfers are expected to be automatically processed and expedited, via web-platforms and/or mobile apps.²⁰

Despite the noise around blockchain and its potential to address critical tenure administration issues, an analysis of the actual application of the technology provides a more nuanced assessment. There have been attempts to use, or at least test, the technology in land management or in the real estate sector (sometimes in private sector initiatives) in at least 22 countries since 2016.²¹ In many cases, detailed information on the precise focus and status of these projects has not been published. Based on the information that is available, however, it appears that in most cases the projects have not gone beyond an initial proof-of-concept stage (see graphic).

The only country where blockchain technology is currently used in land management on a somewhat larger scale is Georgia – one of the best known use cases overall (see Chapter III.3). Other projects that have received considerable attention are a pilot project in Sweden (since 2017)²² and Andhra Pradesh/India (since 2018) (see Chapter III.4).²³ In both Sweden and India, the company ChromaWay is heavily involved. In Georgia, the Netherlands-based company Bitfury is implementing a pilot blockchain land project. The US company Medici Land Governance (MLG)²⁴, a subsidiary of online retailer Overstock Inc., is doing the same in Rwanda and Zambia. This points to the important role that private companies play in digitalization processes in general, and blockchain in particular. ChromaWay is also involved in an ongoing two-year project funded by the Inter-American Development Bank (IADB) to test smart contracts for land transactions in Peru, Bolivia and Paraguay to “unlock the value of real-world assets and to exchange them in real time”.²⁵ Finally, the Asian Development Bank funds a blockchain/smart contract pilot project in Fiji that focuses on digitizing the land registry and developing a prototype blockchain platform to lease land to investors.²⁶

3 | LAND-RELATED DIGITALIZATION PROCESSES AND HUMAN RIGHTS-BASED GOVERNANCE OF TENURE

Over the last decade, there has been an increasing understanding and recognition that land is a human rights issue. Several human rights bodies and policy guidance documents have clarified the inextricable connection between land and human rights (among others the rights to food and nutrition, housing, water, work, a healthy environment and housing) which advanced the understanding that land in itself is a human right.²⁷ Land has been explicitly recognized as a human right of indigenous peoples in the International Labour Organization’s (ILO) *Indigenous and Tribal Peoples Convention* as well as the *UN Declaration on the Rights of Indigenous Peoples (UNDRIP)*. More recently, the *UN Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP)* has recognized the right to land for all rural people, including peasants, pastoralists, small-scale fishers, indigenous peoples and agricultural workers.²⁸ Land has also been defined as a human right for rural women by the Committee on the Elimination of Discrimination Against Women (CEDAW).²⁹

The *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests* (henceforth referred to as Tenure Guidelines)³⁰ remain the most comprehensive international normative document dealing with governance of land and natural resources from a human rights perspective. These guidelines were unanimously endorsed by the UN Committee on World Food Security (CFS) in 2012 after a three-year participatory process.³¹ The Tenure Guidelines provide guidance to states on how to govern land, fisheries and forests. They contain both general principles of human rights-based governance as well as specific guidance on critical aspects of tenure governance. Importantly, the Tenure Guidelines are firmly grounded in human rights and provide authoritative guidance on how states should interpret their human rights obligations in the context of tenure governance. This includes putting

With the help of smart contracts land transfers are expected to be automatically processed and expedited, via web-platforms and/or mobile apps.

Several human rights bodies and policy guidance documents have clarified the inextricable connection between land and human rights.

ICT are applied in a given economic, cultural and social context, which is often marked by great power imbalances and marginalization of certain groups.

particular emphasis on vulnerable and marginalized people (para. 1.1). Moreover, the Tenure Guidelines contain a number of guiding principles of responsible governance of tenure, which are aligned with human rights principles. These include non-discrimination, participation, gender equality, equity and justice, accountability and continuous improvement, among others (section 3B).

A critical element of the Tenure Guidelines is that they clarify states' duty to recognize, respect, protect and promote all legitimate tenure rights, including those that are not formally recorded or protected by law (section 3A). This applies in particular to tenure rights and systems that are collective and managed through customary systems (sections 9 and 10). The Tenure Guidelines further contain guidance on the governance of public lands, fisheries and forests, including those that are collectively used and managed (section 8), as well as on the transfer of tenure rights through markets, investment projects, restitution and redistributive reforms (chapter 4). They also underline the need for adequate policy, legal and organizational frameworks (section 5), and provide detailed guidance on the administration of tenure, including tenure records, taxation, spatial planning and the resolution of disputes over tenure rights (section 17). It is important to note that the Tenure Guidelines clearly state that governance of land and natural resources needs to support broader policy objectives, in particular the realization of the right to food, poverty eradication, sustainable livelihoods, social stability, rural development, and sustainable social and economic development (para. 1.1).

Digitalization is not explicitly addressed by the Tenure Guidelines. However, the use of digitized information as well as digital tools and platforms in the context of land needs to be understood in the broader context of tenure governance. As the case studies contained in this paper will show, digitalization cannot be viewed merely as a technical issue of land administration. ICT are applied in a given economic, cultural and social context, which is often marked by great power imbalances and marginalization of certain groups – in particular rural people and communities. Another important aspect to take into account is the existing 'digital divide', which has strong rural and gender dimensions, and which creates additional forms of discrimination and marginalization.³² The Tenure Guidelines should therefore serve as a crucial guidance document in the context of land-related digitalization processes. It should be noted, however, that current digitalization projects and processes rarely, if at all, refer to the Tenure Guidelines.

In order to analyze the case studies contained in this paper, the authors developed and applied an analysis grid (see Annex 1), which is based on the Tenure Guidelines and can assist in assessing land-related digitalization projects and processes. The aim is to provide a practical tool for different actors (policy makers, implementation agencies, judicial authorities, affected communities and people, CSOs, etc.) to delimit problem areas, identify risks and define criteria for digitalization processes that support the realization of human rights.

In order to serve as a practical tool, the proposed analysis grid does not refer to all provisions of the Tenure Guidelines, but rather focuses on some key issues in the context of digitalization, namely:

- Key principles of human rights-based tenure governance, including prioritization of marginalized people; gender equity; recognition, protection and promotion of different forms of tenure rights and systems; transparency and participation; access to justice; accountability; contribution to broader policy objectives;
- Policy and legal frameworks related to tenure governance as well as those that regulate information and communication technologies (ICT) as they apply to tenure;
- Administration of tenure, including identification and recording of tenure rights; use of digital registries; consistency with spatial planning policies; availability of sufficient resources; and

- Transfers of tenure rights, including promotion of land transactions; safeguards in the context of land-related investment projects and land markets; equitable access to and distribution of land.

For each issue, the analysis grid provides a list of questions and refers to the relevant provisions in the Tenure Guidelines. The authors acknowledge that this analysis grid may be further improved and developed in a dialogue with relevant actors. However, the authors hope that it can serve as an instrument to better incorporate human rights in land digitalization processes, to apply the Tenure Guidelines and to advance responsible governance of tenure in general.

III.

Case Studies

1 | BRAZIL: LAND REGISTRIES GO DIGITAL – NEW TOOLS FOR DIGITAL LAND GRABS

In Brazil, digital land registration systems have become new tools for ‘digital’ land grabs.³³ Powerful actors, such as agribusiness companies, mining firms, wealthy individuals as well as local elites and governments, use digital registries to claim lands thereby dispossessing people and communities. This dynamic fosters and exacerbates the country’s most burning tenure issues, which are: land concentration, lack of protection for rural people’s tenure rights – especially collective forms of tenure – and widespread fraud and corruption in the land administration sector. The government promotes digitalized rural land registries as a silver bullet to overcome structural problems in land governance and administration.³⁴ Yet, in reality, these digital tools maintain and even intensify problems of corruption and ineffective institutions, lack of legal protection of community tenure rights and land concentration. The new digital tools drive the expansion of the agricultural frontier and speculation of land at an even faster pace, perpetuating land conflicts and increasing the dispossession of rural people.

Over the past years, two digital rural land registries have emerged as key instruments exacerbating the expulsion of rural communities from their lands: the *Land Management System (Sistema de Gestão Fundiária – Titulação, SIGEF, 2013)* and the *National Rural Environmental Cadaster Registry (Sistema Nacional de Cadastro Ambiental Rural, SICAR, 2014)*. Registration in a digital rural cadaster is a precondition for obtaining agricultural loans and credits, accessing agricultural support programmes and environmental permits, proving compliance with environmental regulations, and participating in compensation schemes and markets. SIGEF and SICAR are the most recently established online registries and – in comparison to older registries (SNCR³⁵ and SNCI³⁶) – fully digitized, automated and self-declaratory. This means that any person can enter the required information into the online database. Although the responsible authority³⁷ is obliged to verify the entered data, this rarely happens, and this allows fraud. In 2016, an audit for SIGEF revealed that 10 per cent (2.6 million hectares) of the assessed 27 million hectares of land showed inconsistencies.³⁸ As a result, 148 registrations or certifications were cancelled.³⁹ Notably, this audit concerned only a fraction of the registered land in the different registries.

Two digital rural land registries have emerged as key instruments, exacerbating the expulsion of rural communities from their lands.

Some Brazilian states assume that an analysis of the information in the SICAR, for example, would take between 25 and 100 years.⁴⁰

Importantly, a registration in all digital registries theoretically requires proof of ownership, but in practice, the certificate can still be obtained, without providing (uploading) the required document online.⁴¹ In addition, there are huge discrepancies between the four existing registries. For example, land often occurs in different registries under multiple names and with varying delimitations regarding the size of plots. Consequently, none of the systems reflect the reality on the ground. Powerful and resourceful actors use these gaps deliberately to make and consolidate land claims and, thereby, dispossess local people from their lands – even though the registration certificate does not legally either represent proof of land ownership or land title⁴².

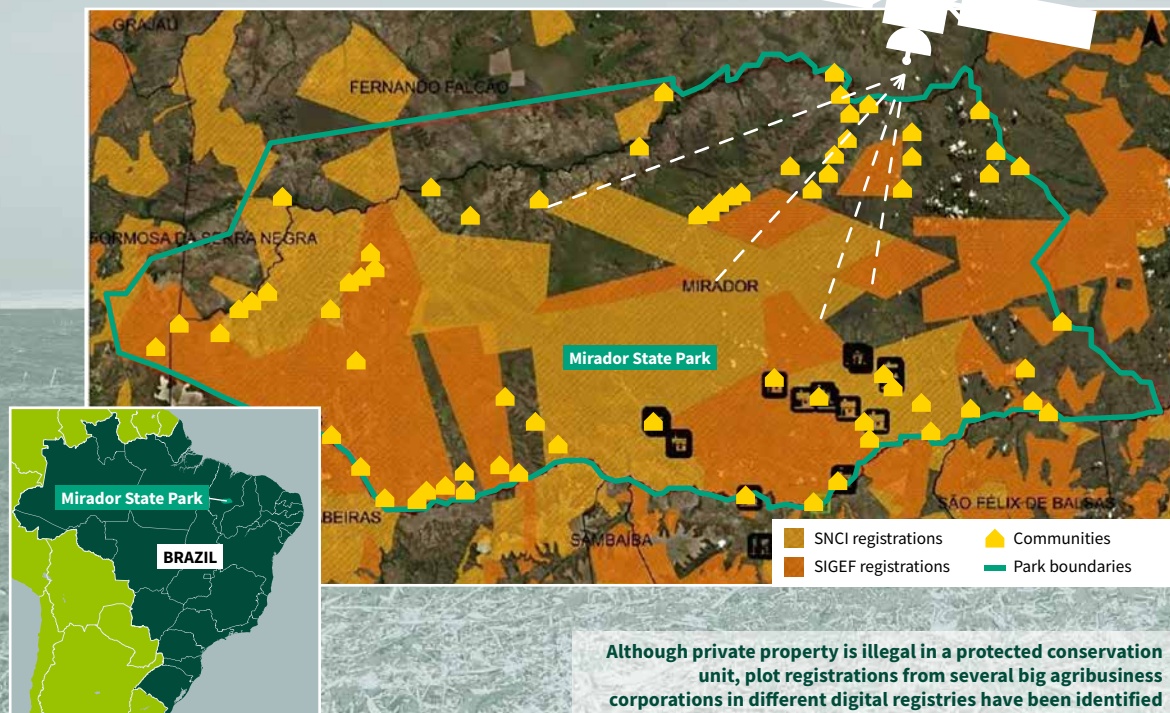
The following examples from the southern area of the state of Maranhão show how these digital land registries are played out against rural communities of indigenous and traditional peoples who have been living on their lands for generations.⁴³ Maranhão is part of the MATOPIBA⁴⁴ region and located in the Cerrado, which represents both a critical ecosystem and one of Brazil's hotspots for land grabbing.⁴⁵

Mirador State Park

Mirador State Park is a conservation area covering more than 700,000 hectares of land which was created in 1980 to protect the Itapecuru River, an essential water source for the region. The creation of the park dispossessed over 1,000 families of traditional peoples who had been living in the area for at least five generations. The establishment of a conservation area made their presence in the park illegal, jeopardizing their traditional livelihoods (including hunting, fishing, farming and keeping livestock).⁴⁶ Since then, the communities have been claiming the realization of their rights to their ancestral lands. Today, some communities have remained in the area – resisting and struggling to survive – while others have left the park. Over the last few years, a growing number of agribusiness farms (producing sugar cane, soy, and corn) have encroached onto lands situated within the park, further marginalizing rural people and threatening their human rights.

Currently, over 54 registered plots from different agribusiness corporations (including two of the biggest Brazilian agribusiness corporations, BrasilAgro and Agroserra⁴⁷) in SIGEF and SICAR have been identified in Mirador State Park – even though private property is illegal in a protected conservation unit⁴⁸ (see map/graphic). Thus, the SIGEF and SICAR certificates could have helped the corporations to gain control over lands that traditional communities have already occupied for centuries and expand their operations within the park. The responsible government authorities have never evaluated these false registrations, especially the validity of land ownership titles and superpositions of the land properties with registrations in other registries. What is more, according to affected communities, the State Secretariat of Environment and Natural Resources (SEMA), which is responsible for monitoring the conservation regulations in the park, is complicit with the agribusiness companies.⁴⁹ Testimonies from affected communities further point out that SEMA only carries out inspections regarding their livelihood activities and frequently fines them for illegal logging. Yet, according to them, deforestation and many forest fires – regularly practiced by corporations to expand their agricultural farms – remain uninvestigated.⁵⁰ In sum, the digital registries do not impede illegal encroachments into the conservation area. More importantly, they legitimize and cement the historic dispossession of the rural communities living in the area.

Digital Registrations of Private Plots Mirador State Park



Although private property is illegal in a protected conservation unit, plot registrations from several big agribusiness corporations in different digital registries have been identified in the park. Various registrations have overlaps and are located within or around community villages.

Source: reproduced from Pereira Ferreira, J.L. (2019): "A Gente Quer Viver A Vida Que A Gente Vivía Antes Do Parque Chegar: Uma leitura sobre a disputa socioterritorial entre o poder público-privado e as comunidades tradicionais dos rios Itapicuru e Alpercata". Universidad Federal Do Maranhão.

Fazenda Picos

The case of Fazenda Picos underscores how alleged landowners use data irregularities between different registries to willfully create confusion over land tenure situations as a means to grab land and dispossess rural communities. One alleged owner of the farm, which is located close to the municipality of Balsas, has filed a legal case to raise claims over land that has been partly occupied and used by a peasant community since the early 1900s. He claims that the property that he acquired in January 2013 covers an area of 4,000 hectares of land. However, in the SNCI system, the property is registered with an area of only 2,981 hectares of land, in SNCR with an even bigger area of 5,976 hectares of land and multiple owners, and in SIGEF, the property shows several registrations. Noteworthy, the SIGEF enrollments were modified in 2017 and do not include a land title.

The traditional territory of the peasant community covers around 1,000 hectares of land that overlaps with the property registrations of the concerned landowner in the SIGEF system. Although the SIGEF registrations lack validation or proof of ownership by the alleged farm owner, it is incumbent on the community to prove that those land claims are unjustified and wrong. This situation places an additional burden on the community which has few financial resources to defend their rights in court and limited knowledge of the digital registration processes. Now the community has to struggle harder to prevent the loss of their traditional lands and livelihoods. More worrying, the digital tools accelerate land grabbing and further pressures the recognition and protection of the communities' legitimate tenure rights, although they hold the constitutional right to their ancestral territories.

Over 54 registered plots from different agribusiness corporations in SIGEF and SICAR have been identified in Mirador State Park – even though private property is illegal in a protected conservation unit.

These digital rural land registration mechanisms fail to address the weaknesses of land governance and administration in Brazil, and reproduce patterns of dispossession and marginalization of indigenous and traditional peoples at an even faster pace.

The number of land conflicts in Brazil has increased alarmingly in the past ten years.

These two cases highlight that digital rural land registration mechanisms fail to address the weaknesses of land governance and administration in Brazil, and reproduce patterns of dispossession and marginalization of indigenous and traditional peoples at an even faster pace. The automated, self-declaratory systems create more confusion over land rights and increase land insecurity for rural people. Thus, the systems benefit those who have the access, knowledge and financial resources to carry out the registrations and use them to their own advantage. Institutions often accept the certificates that were awarded on the basis of false claims as *de facto* proof of ownership, be it because they are complicit, or because they are themselves not acquainted with how the different registries function. Consequently, powerful and resourceful actors use the digital registries deliberately to ‘legalize’ their land claims and land grabs. The system’s ‘first come, first served’ principle pushes affected communities into an uphill battle. They have to prove that the land grabbers’ claims are false, even before having their own tenure rights recognized – a challenging and costly matter, especially in an overall context that is marked by extreme inequalities and marginalization of traditional rural communities.

In the long run, the way these digital registries operate and are used is likely to impel and worsen existing land tenure issues, including: i) land concentration; ii) lack of protection of community lands (in particular collective lands); iii) fraud and corruption in land administration; iv) land conflicts; and v) inequality and marginalization of poor and rural people. Moreover, the digitalization of land registration systems triggers further privatization, commodification and financialization of land. The described systems are tailored to facilitate individual, private, and exclusive land ownership and – except for the CAR – do not allow for the registration of other forms of ownership and tenure. As a result, private ownership over public lands is steadily increasing while communities are ‘erased’ from their own ancestral territories.⁵¹ The promise of having access to credit and public support programmes is used to incite indigenous and traditional peoples to register their lands as private lands instead of communal lands. What is more, marginalization of rural people, structural inequalities, poor digital literacy, lack of access to digital devices, limited financial capacity, and distrust of government-controlled land governance systems (especially for indigenous peoples) make these digital land registries inaccessible or unusable for communities who want to have their land rights recognized. The low number of registrations of communal lands reflects this: in 2019, only 6 percent of registrations in SICAR were lands that are designated as the collective territories of indigenous peoples, quilombolas and traditional peoples and communities, whereas indigenous territories alone are estimated to account for around 14 per cent of the national territory.⁵²

The focus of the digitalization process and the digital registries clearly lies on facilitating land transactions and investments. In fact, they promote land as an ‘investable’ and tradable asset and available for speculation. This approach goes against the value indigenous and traditional peoples ascribe to land – a common good with social and cultural significance. It is illustrative that the putting in place of the new digital registration systems coincides with the creation of the MATOPIBA region in 2015 as a target area for agricultural expansion – sometimes referred to as the world’s last agricultural frontier. Since then, the region has seen a surge in land grabbing and speculation, accompanied by human rights violations and environmental destruction.⁵³

Notably, the number of land conflicts in Brazil has increased alarmingly – particularly in MATOPIBA – in the past ten years. In 2019, 1,254 land-related violent incidents occurred, which is an increase of 11 per cent compared with 2018 – and the highest number recorded since 1985. Maranhão is currently the state with the most land conflicts.⁵⁴ It should be noted that several projects funded by international institutions and banks, such as the World Bank,⁵⁵ supporting digital registration systems explicitly exclude areas that are subject to land conflicts.

2 | INDONESIA: LAND CONFLICTS AND THE ‘BATTLE OF DIGITAL MAPS’

In 2019 Indonesian civil society organizations documented 279 agrarian land conflicts across the country, affecting more than 100,000 families.⁵⁶ At least fourteen people were killed and 24 shot and injured in the context of land disputes.⁵⁷ At the root of such land conflicts is the massive give-away over the past decades of land formally under state control to agribusiness, logging, and mining companies; a push for infrastructure projects; and the weak recognition of land rights of peasant and indigenous communities.

The Indonesian government has promised wide-ranging agrarian land reforms, including resolving land disputes and addressing the inequality of land ownership by redistributing millions of hectares of land to the landless, smallholder farmers, and (indigenous) communities. It has however dragged its feet on implementing these reforms, focusing instead mainly on distributing land certificates to landowners in undisputed areas and developing land markets.

In 2018, the government of Indonesia and the World Bank embarked on the five-year systematic land titling programme.⁵⁸ The goal of the USD 240 million *Program to Accelerate Agrarian Reform* is to title more than four million land parcels in predominantly rural areas of seven provinces in Kalimantan and Sumatra. The project features an ‘all-digital’, supposedly participatory, mapping and registration process, with spatial and legal data recorded digitally in the field with the help of tablets, apps and (Real-Time Kinematic) high-accuracy positioning technology. A closer look at how the ‘participatory’ process is implemented – the government’s standard systematic land registration approach (PTSL) – shows that it is essentially a typical top-down approach,⁵⁹ with some rudimentary community participation components added to it. In addition to the field parcel mapping, satellite imagery is extensively used to produce digital maps that cover all non-forest administrative areas and tenure forms, including various concession and mining areas, customary land, and state forest boundaries. These digital maps are planned to be used for all public sector land use planning and management.⁶⁰

Substantial investment is also made to upgrade the existing land information system into a ‘next generation’ digital land registry and cadastre called ‘eLand’, which will contain land rights, land use, and geospatial information. The eLand system will make land information accessible to the public and the private sector (banks, real estate market facilitators and land evaluators) via a public online portal and mobile applications. A range of e-services will be offered and capabilities for digital signature and electronic transactions introduced. The eLand system will thus be highly beneficial to private investors, allowing them easier access to land in rural areas.

While the World Bank claims that the project will contribute to conflict resolution and enhance agrarian reform and tenure security of indigenous communities, it does in fact fail to address these fundamental issues in any significant way. The project focuses only on the issuing and distribution of land certificates in so-called ‘clean and clear’ areas without overlapping land claims, whereas areas under territorial conflicts, as well as areas classified as state forest (where in fact many villages are located and indigenous communities often assert customary land rights claims), are explicitly excluded from the project’s scope.

Peasant and indigenous communities across the target provinces in Sumatra and Kalimantan that are entangled in land conflicts with large-scale agri-business plantations, mines, or infrastructure projects will hence not benefit from land regularization under the World Bank-funded project. However, digital mapping and demarcation of lands, that are supposedly available for investments, is contributing to the dispossession of rural communities. One such land conflict is located in Jambi province of Sumatra, where the PT Lestari Asri Jaya (PT LAJ) company is establishing a ‘sustainable’ rubber plantation on 60,000 hectares of land in a buffer zone bordering a national park.⁶¹ PT LAJ is a subsidiary of PT Royal Lestari Utama (RLU), a joint

Digital mapping and demarcation of lands, that are supposedly available for investments, is contributing to the dispossession of rural communities.

venture between the French transnational corporation Michelin and Indonesian company Barito Pasifik. In 2018 PT RLU received a USD 95 million bond to support its 'natural' rubber plantations in Jambi and Kalimantan through a newly created financial facility founded by the UN Environmental Program (UNEP) and private sector actors. The 'innovative' facility aims at combining environmental protection with business opportunities.⁶² The smallholder farmers affected by the PT LAJ natural rubber plantation in Jambi have been actively resisting the land grab for several years, by asserting their land rights. With support of one of Indonesia's main peasant unions, Serikat Petani Indonesia (SPI), they produced their own maps to challenge the official maps that saw their land claims ignored in favour of corporate claims. SPI and communities have used these maps in their dialogues with authorities to assert the communities' land rights.

Such participatory or counter-mapping initiatives by local communities and non-governmental organizations emerged across Indonesia in the 1990s. This is an example of bottom-up, community-driven use of digital technologies in the context of land. Today there is a strong civil society movement promoting community counter-mapping with the help of handheld GPS devices, GIS software, and sometimes even drones, to advance land rights of marginalized communities, in particular customary rights of indigenous communities.⁶³ Since the inception of the government's One Map policy in 2011 which aims to resolve overlapping land claims and disputes by creating a complete database of maps from different state agencies, a consortium of non-governmental organizations has guided communities all over the country through participatory mapping processes to demarcate indigenous territories. The consortium has carried out advocacy, asking the government to recognize these territories and has repeatedly submitted participatory maps of indigenous territory covering an area of over 10 million hectares to relevant government agencies. However, the government has so far only included a tiny fraction of the indigenous territories in its own maps.⁶⁴ Another major concern of affected communities and CSOs is that the One Map online geoportal, which was launched in 2018 and should integrate the various digital thematic maps is not publicly accessible.⁶⁵ Despite the policy's stated goal to increase transparency in the land sector, access to the portal is so far restricted to some government bodies.

3 | GEORGIA: DIGITIZING LAND ADMINISTRATION FOR FLUID MARKETS

Georgia has seen an impressive transformation in the land sector in the post-Soviet era.⁶⁶ State land has been privatized at a massive scale and land registration is ongoing with substantive donor support. Over the last fifteen years efforts have been increased to digitize land data in line with Georgia's overall strategy to digitalize public services, creating the so called 'e-government'. Today, Georgia is acclaimed by proponents of digitalization as one of the countries to make the most progress in e-government services, especially its digitalization in the context of land governance (including the application of blockchain technology). However, discussions about possible negative implications and especially information about the impact on marginalized people are mostly absent.

After the end of the cold war Georgia conducted massive land reforms to alleviate poverty and hunger. Between 1992 and 1998, plots of 0.15 to 1.25 hectares of state land were distributed to about one million families, constituting some 90 per cent of the population. While the beneficiaries received certificates, the land was not actually registered. In the following years land registration projects started and laws were introduced to develop land ownership towards establishing a private property regime – including the right to buy, sell and lease land. In other words: concerted efforts were made to establish a land market. The World Bank, USAID and the German development bank KfW were pivotal in driving this process.⁶⁷ While most of the land in the capital Tbilisi is registered today, land certificates prevail in rural areas and

ownership is not registered at the National Agency of Public Registry (NAPR). The Ministry of Agriculture estimated that in 2014 only 15 to 20 per cent of the agricultural land plots were registered.^{68 69}

In 2006, the NAPR started digitizing the registered land under a KfW-funded project entitled *Cadastre and Land Registration*. Today, digital registries include not only land records and data on land transfers but also spatial zonings and the digitization of geo-referenced soil data.⁷⁰ Digitized land data is fully publicly available and includes geo-references (GPS data), information on mortgages and the normative land price.⁷¹

In 2016, NAPR signed a memorandum of understanding (MoU) with one of the leading Bitcoin mining companies, Bitfury, to explore blockchain use in the land sector. At that time, Bitfury already had substantive digital infrastructure (server parks) in Georgia with about 10 to 15 per cent of Georgia's electricity consumption devoted to cryptocurrency mining.⁷² In a first step, the NAPR established an internal blockchain (based on the Bitfury blockchain framework, called Exonum) to put registered digital land records with a unique electronic code (hash) onto it. From 2016 to 2019, some 300,000 hectares of land were integrated into the digital system in this way. According to Bitfury, this equals to some 1.5 million titles that are now recorded on a blockchain.⁷³ In addition, the hashes of the internal NAPR blockchain are anchored on the global Bitcoin blockchain (see graphic).⁷⁴ It is argued that this addition provides extra 'outside validation' to the NAPR records. The government recently announced plans to accelerate the digitalisation process and to register an additional 1.2 million hectares of land over the next three years.

Stalled: The automated land market

In a second step, the NAPR, together with Bitfury and the German development cooperation agency (GIZ), explored the possibility of creating an automated land transaction system based on so-called 'smart contracts'. However, this has proven to be very complicated. In its work aimed at developing a legal framework for the transition to blockchain technology, GIZ commissioned a legal study that suggests a set of 27 recommendations to address legal concerns that might arise from the implementation of smart contract-based land transfers. Some of them are:

- Based on Georgian law, land transfers should be registered on the public register. Given that the Bitcoin blockchain is not a public register, it cannot replace the NAPR register. A change in law removing the requirement of a public register, thus allowing for the storing and processing of public land administration data, would have substantive implications regarding sovereignty and governance.
- The existing law also states that all acts and services need to be done in territorial offices. Through smart contracts certain services could be conducted in a non-territorial (global), 'de-centralized cyberspace'.⁷⁵
- Property transfers must be documented in a written form (understood as language). This can conflict with documentation through electronic codes in smart contracts.
- Moreover, in cases of illegal identity and ownership verification (through falsified documents), corrections and revisions must be possible. With blockchain this might be much more complicated. As a blockchain expert put it, if you put wrong data into the chain, this is a pretty fatal moment. Experts also argue that a verification of transfer rights can only be done in a fully automated way once the entire cadastre is digitized, which will take many years, if not decades, in Georgia.
- For these reasons, the automated land market has not (yet) materialized in Georgia. Apart from the problems listed, local experts explain that the central reason for not moving on with the smart contract-based system is the unwillingness of the banking sector to participate (for unknown reasons).⁷⁶

Laws were introduced to develop land ownership towards establishing a private property regime – including the right to buy, sell and lease land.

The example of Georgia points to the significant costs of digitalized land administration and governance, in particular in the context of blockchain and smart contracts.

Costly digitalization? The efficiency argument questioned

Proponents of digitalization argue that the use of digital technologies and the automation of land cadastre and transfers are highly cost efficient. Bitfury argues that “operational costs [are] reduced by up to 90%”⁷⁷ for the land administration process. But available documents are silent about the total costs associated with digitizing land data and the use of blockchain in Georgia (and elsewhere). As of today, NAPR has to run three different systems, namely: 1) the ‘old’ paper and in-person system; 2) its internal digital registry (including the internal blockchain and the website); and 3) the Bitcoin blockchain system. The example of Georgia thus points to the significant costs of digitalized land administration and governance, in particular in the context of blockchain and smart contracts. These include:

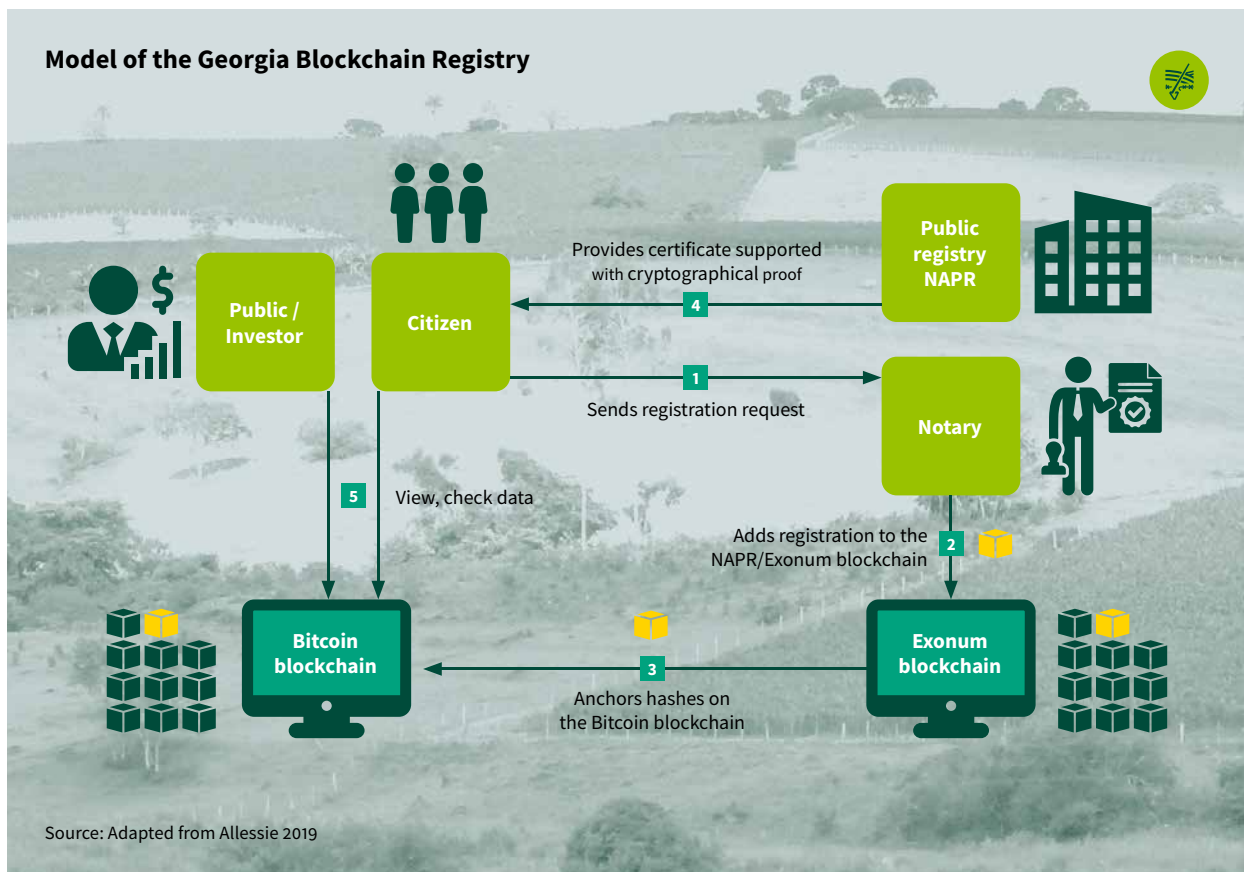
- Investments in electronic infrastructure (that must be safe against hacking). In contrast to Georgia’s capital, Tbilisi, rural districts do not have such infrastructure and might not be able to cover such costs.
- Additional expert ICT staff.
- Software and ICT systems with high protection standards that need to be constantly updated. For example, hackers found a bug on the Ethereum blockchain and drained some USD 50 million.⁷⁸
- Additional energy costs for blockchain mining.
- Transaction costs for the Bitcoin blockchain (in the form of processing fees paid to miners) rose to over USD 30 per transaction in the last years.⁷⁹ While these costs were not disclosed,⁸⁰ the proclaimed 1.5 million titles transferred to the blockchain could amount to some USD 45 million. Bitfury took over these costs as part of the MoU but only for the duration of the experiment phase.
- According to Georgian experts, associated costs of digitalization and blockchain use raise serious questions about the implementation in rural areas, where municipalities do not have the money to run these systems.

Cyber land market in absence of human rights?

Fostering land markets is one of the main objectives of the digitalization process in Georgia. Consultants to the blockchain project state that it “helps both Georgians and non-Georgians to compete, as regards immovable property purchase, on a level playing field.”⁸¹ As one of the reasons for its support to the blockchain-based cadastre through its Ministry of Development Cooperation (BMZ) and the GIZ, the German Federal Government states that “improving legal certainty encourages foreign investment, which, in return, promotes sustainable economic development.”⁸² In the rural context, “land market development” is linked to the idea of land consolidating, i.e. shifting the land ownership structure from many small landowners to fewer, larger and more competitive ones. Under a World Bank project titled Irrigation and Land Market Development, the “creation of a computerized land management tool to integrate information about the location, ownership, use, quality and price of land parcels [...] would make it easier for investors to identify owners and locale land with the characteristics they require.”⁸³

The impacts on marginalized groups are not addressed in the projects nor are they part of the project designs. The research also could not find any information on how a future blockchain-based land governance and automated land market would comply with human rights principles like non-discrimination (also in access and dealing with e-services), land concentration or the respect, protection and promotion of different forms of legitimate tenure rights. This is at odds with states’ and intergovernmental institutions’ human rights obligations and commitments to take into account human rights as ‘overarching principles’ for all digitalization projects.⁸⁴

Model of the Georgia Blockchain Registry



4 | INDIA: A BLOCKCHAIN-BASED LAND REGISTRY TO ADDRESS CORRUPTION?

In the past ten years powerful and resourceful actors influencing the government have driven India's massive surge in digitalization of public administration systems and processes.⁸⁵ The contested national digital biometric identity system, the Aadhaar ID, exemplifies the pace at which digital processes have been designed, developed, and deployed in the country. The Aadhaar ID stores biometric details linked to other information about individuals (e.g. fingerprint and bank account).⁸⁶ Since 2009 over a billion people have voluntarily registered with the digital identity system. Aadhaar is not a proof of citizenship but has become mandatory in order to access certain public services (e.g. subsidized food for the poor) – despite its data privacy and security gaps.⁸⁷ In fact, Aadhaar blurs the boundaries between security and surveillance. More worrying is that several cases were reported where someone failed to link their ration card to the ID, for example due to poor internet connection, and has starved to death.⁸⁸ The widely opposed national Data Protection Bill is likely to exacerbate this situation by allowing stronger surveillance and undermining privacy.⁸⁹

Aadhaar's 'success' prompted India's central and state governments to increase the digitalization in the context of land governance and administration systems. With the stated objective of fixing important land administration problems (especially widespread corruption and inefficient administrative processes), they initiated various land-related digitalization projects and processes. Today, eight blockchain-based projects for land administration have been tested across different states. In 2008, the Ministry of Rural Development launched the countrywide Digital India Land Records Modernization Programme (DILRMP), which aims to update land records, automatize mutations (i.e. recording the transfer of ownership), and integrate textual and spatial record systems. More importantly, it should replace the presumptive titling system with a conclusive titling system that provides a title guar-

In 2018, about 86 per cent of land records had already been digitized.

The case of Andhra Pradesh shows that blockchain-driven land digitalization initiatives fail to address the weaknesses of the implementing institutions and create new entry points for corruption and fraud.

antee – a key hurdle in India’s land governance system. In the DILRMP the ministry started to digitize land records, spatial and cadastral maps, as well as the deeds registry. In 2018, about 86 per cent of land records had already been digitized.⁹⁰ However, the implementation of the program is error prone.⁹¹

India’s land governance and administration is complex. With over 2,000 different land laws and policies across all states land legislation is fragmented and sometimes even contradictory. Land records are unclear, unmaintained, and often do not reflect the reality on the ground. Obtaining land ownership is a complicated, costly, and time-consuming process as it is established through a number of different documents that are difficult to access.⁹² The land rights of tribal people are poorly recognized and not well protected and, in general, land tenure insecurity for rural people and communities is high. Land conflicts have become an enormous problem, making up almost two thirds of civil cases pending in Indian courts.⁹³ Corruption is also rampant with an estimated \$700 million paid in bribes to land registries.⁹⁴

Against this backdrop, digitalization – in particular based on blockchain technology – is put forward as a panacea to end corruption, facilitate registration processes, and to create clarity on ownership rights. Starting in 2017 several states have initiated national pilot projects that tested the blockchain technology for land registration and administration. State-led pilot projects have been identified in Telengana,⁹⁵ Uttar Pradesh,⁹⁶ Madhya Pradesh⁹⁷ and Goa.⁹⁸ A number of public pilot projects in cooperation with private tech companies have been carried out in Andhra Pradesh,⁹⁹ Maharashtra,¹⁰⁰ Rajasthan¹⁰¹ and Haryana (in collaboration with the United Nations Development Programme).¹⁰² Notably, Andhra Pradesh is the only state that has established a ‘large-scale blockchain pilot project’ while other states reached only the stage of “proof-of-concept” with limited information available regarding progress and plans for wider application.

The case of Andhra Pradesh shows that blockchain-driven land digitalization initiatives fail to address the weaknesses of the implementing institutions and create new entry points for corruption and fraud.¹⁰³ As a result land disputes remain unresolved and land tenure insecurity is likely to increase. Andhra Pradesh’s government-led land digitalization project includes various pilot projects (such as the planned development of Amaravati, the state’s new capital city¹⁰⁴) that were carried out in collaboration with different tech companies since 2017. Two major partners are Chromaway – a Sweden-based tech company that is involved in numerous land-related blockchain initiatives worldwide – and the Indian start-up company Zebidata, which have supported the establishment of the blockchain-based land registry using a web app.¹⁰⁵ The blockchain company ConsenSys has provided additional strategic technical advisory services.¹⁰⁶ The government promotes the project as being key to increasing efficiency and averting fraudulent tampering of land records by outsiders or even government insiders – a major problem in land governance and administration in the state. As an indication of how the new system will make administration more efficient, the government points out that costs for document writers are saved and the registration documents can be sent in real-time via QR code to the land registrar.¹⁰⁷

In 2018, the pilot project in Amaravati, which requires about 217 square kilometres of surrounding farmland¹⁰⁸ to build the new capital city, already had more than 85,000 land records in the database.¹⁰⁹ However, according to local peasant communities the procedure of digitizing land records is manipulative and continues to involve bribery of land registry officers.¹¹⁰ There are also reports of harassment and threats by land administration officers to pressurize local communities and people to commit to the program by registering their lands. It is further unclear how the program deals with overlapping claims to land or resolves land disputes that existed prior to the digitization of land records. A so-called ‘land pooling method’, where landowners voluntarily sign ownership rights over to a single agency or government, must also be viewed critically. Participants to this scheme receive a smaller portion of land in return (25 to 30 per cent) equipped with electricity and relevant

infrastructure in addition to a compensation payment.¹¹¹ This method helped the government to acquire more building land to establish the envisaged city of Amaravati, but it raises questions about how rural people and communities can maintain their livelihoods on the smaller plots. Even though land plots have been digitally registered, the land record information, especially on the plot's location, was not shared with some record holders. According to media reports, some local peasants have complained that politicians have received the most fertile and best situated plots.¹¹² Other reports point out that peasants from tribal communities have been only offered compensation for their land instead of plots.¹¹³

The blockchain-based land ownership records in Amaravati (including marked boundaries with coordinates, neighboring plots, etc.) are also linked to the Aadhaar ID.¹¹⁴ This 'integrated data system' – which is sometimes referred to as '3D digital registry' – may increase the risk of fraud and misuse as the information is only accessible through a single app (called MyAmaravati). What is more, even though the state government claims that digital literacy is high among project participants in Amaravati, it remains unclear whether they all own a digital device in order to access the MyAmaravati app.¹¹⁵

Moreover, local peasants have criticized the usage of a private blockchain as the public can only view information and not monitor whether illegitimate changes have been made to the records. Overall the example points to serious concerns about the introduction of blockchain technology for land registry in a state with endemic corruption and low trust into public institutions.¹¹⁶ Digitalization alone will clearly not prevent fraud or help to overcome key issues in land administration.

5 | RWANDA: FROM DIGITAL LAND REGISTRIES TO 'SMART' INFORMATION SYSTEMS

Rwanda¹¹⁷ has implemented and completed an impressive countrywide land registration programme and stands today as the only country in Africa with a digital land registry that covers the entire country.¹¹⁸ As a result, the World Bank's influential Doing Business Report ranks it third globally and first in sub-Saharan Africa in terms of ease of Property Registration, attesting that it has created a favourable business investment climate in the (urban) land market.¹¹⁹ The World Bank and other donors consider Rwanda's land regularization programme and land registry as best practice and a role model for other countries in sub-Saharan Africa.¹²⁰

Land is of crucial importance in this compact and densely populated country with its predominantly agrarian economy. Tensions over land contributed to the 1994 genocide, and the societal collapse and the return of hundreds of thousands of refugees in the aftermath have created huge challenges for land management in Rwanda.¹²¹ Following the promulgation of a new land law in 2005 that made land registration obligatory, the government started systematic land titling in the context of the Land Tenure Regularisation Programme (LTRP) in 2009, with substantial funding from DfID, Sweden, The Netherlands and the EU. The stated objectives of the LTRP were to enhance efficient land administration, contribute to poverty reduction through increased investments, optimize land use, and reduce land disputes.¹²²

During the first phase of the LTRP (2009–2013), more than ten million private land parcels were demarcated and registered and a digital registry and cadaster established. Rapid land registration at relatively low costs was made possible by, among others, the deployment of trained para-surveyors and the use of aerial photography and satellite images, as well as the fact that in Rwanda post-colonial, post-independence customary land tenure systems were mainly based on individual (male) land ownership.¹²³ The second phase of the LTRP (2013–2019) focused on consolidating the sustainability of the systems, including continuous upgrades of the digital registry, which is now linked to the tax authority, banks and microfinance institutions, a national identification project, and more recently to a web-based

This 'integrated data system' – which is sometimes referred to as '3D digital registry' – may increase the risk of fraud and misuse as the information is only accessible through a single app.

Between 2009 and 2013, more than ten million private land parcels were demarcated and registered and a digital registry and cadaster established.

65 microfinance institutions and 18 banks access the digital registry to obtain and evaluate potential customer information and make loan decisions.

e-governance portal called *Irembo* that offers some online land services.¹²⁴ Currently further upgrades are conducted with the aim of providing some services as completely paperless, possibly with the help of blockchain technology. The Rwandan land management authorities and the US company Medici Land Governance (MLG) initiated a collaborative pilot blockchain project in late 2018.¹²⁵ No reports about the progress of the project have been released since then.

However, the actual impacts of the land regularization and digitalization for the population are uncertain. A comprehensive, independent impact evaluation¹²⁶ was carried out at the end of the LTRP in 2018/2019 to answer this question. The evaluation found that one of the programme's impacts was that women were enabled to register titles under their own name, individually or as co-owners alongside their husbands. However, no evidence was found that the programme directly reduced rural poverty or increased agricultural investments, as had been envisaged. The evaluation points to the possibility that the LTRP "may inadvertently result in an increase in rural poverty as poorer households sell their land" resulting in land concentration "in fewer, richer hands."¹²⁷ The newly formalized land market and improved access to credit mainly benefits more affluent sections of the population and investors, according to the impact evaluation.¹²⁸ Poorer households sometimes resort to "distress borrowing" for consumption during times of hardship and emergencies, such as medical expenses.¹²⁹ It is further reported that 65 microfinance institutions and 18 banks access the digital registry to obtain and evaluate potential customer information and make loan decisions.¹³⁰

Even though land disputes still occur, the evaluation found that the LTRP has been successful overall in reducing the high number of land conflicts across the country.¹³¹ It is however questionable whether this achievement can be sustained in the long term. The evaluation found that the imposed land tenure and management system lacks legitimacy among parts of the population, especially the poor.¹³² Many Rwandans still choose not to engage with it because they find it "too complex, too difficult to access, and/or too expensive."¹³³ This reluctance might be to some extent due to the high fees charged for registering transactions.¹³⁴ But there is also some resentment as people were led to believe that they would receive ownership titles in the context of LTRP when in fact they were mostly given leasehold titles (such as 99-year leases for agricultural land) following changes made in the legal framework, adding restrictions on subdividing small plots and requirements to adhere to land use plans, or risk dispossession.¹³⁵ A recent World Bank study confirmed that the vast majority of land transactions taking place across the country are not formally registered.¹³⁶ The current situation where there is a formal, digitized system in place, but that (because of costs, lacking infrastructure, etc.) there is a parallel informal system used for transfers of tenure rights paves the way for tensions and new land disputes.

While considerable challenges for the digitized land registry persist, the government of Rwanda pushes the digitalization of land in the context of several other donor-funded programmes even further. During the LTRP more than 24,000 hectares of public land was identified as "suitable for agricultural use" and mapped. The Ministry of Agriculture worked with USAID to develop an online platform featuring map visualization, called the *Agriculture Land Information System* (ALIS), aimed at attracting private investments in agriculture. The web platform provides detailed information on each parcel of public land available for agricultural lease, including on land use, topography, soil quality, crop suitability, irrigation and other infrastructure (see graphic).¹³⁷ Everyone can now scroll through a digital map of Rwanda on their computer or smartphone and search for public (and some private) plots up for lease.¹³⁸ One click on the desired parcel is enough to get in touch with the Ministry of Agriculture to inquire about the lease arrangements. The ALIS is currently being further expanded with the support of the World Bank¹³⁹ into ALIS II, or the *Smart Agriculture Information System* (SAIS). The goal is to add another six million parcels of private land to the web-platform to facilitate land sales or

leases. SAIS will also incorporate a detailed farmer registration and land profiling database (prepared with the help of drone and satellite images).¹⁴⁰ The government intends to use the SAIS to manage its agricultural subsidy programme that focuses on commercialization of agriculture by provision of fertilizers and hybrid seeds to small-scale farmers.¹⁴¹

Everyone can now scroll through a digital map of Rwanda on their computer or smartphone and search for public (and some private) plots up for lease.

ALIS Interactive Online Map for Investors – A Snapshot of Results

Public and Private Land for Sale in Rwanda



Private Land Parcels

For investors: Interested in this parcel? Please click here to contact MINAGRI
 Owners interested in selling or leasing this parcel? Please click here to contact MINAGRI

UPI	50611023851
Size in Hectare	152,32
Village	Mugwato
Cell	Ntovi
Sector	Rukumberi
District	Ngoma
Province	Eastern
Category	Rural
Planned Land Use	Agriculture
Suitable for	Sorghum, Potato, Groundnut, Cassava, Bananas
On irrigated land	No
Minimum Slope (degrees)	0,33
Maximum Slope (degrees)	12,61
Minimum Elevation (m)	1.367
Maximum Elevation (m)	1.415
Average Elevation (m)	1.393,23

Public Land Parcels

Interested in this parcel? Please click here to contact MINAGRI

UPI	50611051973
Size in Hectare	341,61
Village	Shyembe
Cell	Rwintashya
Sector	Rukumberi
District	Ngoma
Province	Eastern
Category	Rural
Land Use	Livestock
Is the land irrigated	No
Is the land terraced	No
Electricity available on the land	No
Distance to electricity	Between 2 km and 5 km
Distance to nearest settlement	less than 1 km
Minimum Slope (%)	0,00
Maximum Slope (%)	19,06
Minimum Elevation (m)	1.329
Maximum Elevation (m)	1.349
Average Elevation (m)	1.331
Gender of main User	Male
Number of people using land	5

Source: www.minagri.gov.rw/investorapp (accessed 19.11.2020)

IV. Analysis of the Case Studies

This chapter contains a summarized human rights analysis of the case studies presented in the previous chapter. The analysis was made using the analysis grid (see Annex 1) and follows its structure. As stated before, this grid is based on the Tenure Guidelines and intends to provide a practical tool to analyze land-related digitalization processes from a human rights perspective.

Human rights-based tenure governance

None of the analyzed land-related digitalization processes refers to human rights standards, nor are they embedded in human rights-based tenure policies. In particular, none of the cases prioritizes vulnerable and marginalized people, namely peasants and other small-scale food producers, traditional communities and indigenous peoples. Prioritizing marginalized people is at the core of human rights and a paramount objective of the Tenure Guidelines (para. 1.1). Moreover, women and the

Digital Mapping and Demarcation of Land – 3 Critical Questions

Who does the mapping and who decides what is mapped?

In practice, the state decides, community mapping is rarely taken into account.

Are all legitimate tenure rights and different forms of tenure taken into account?

In practice, there is a focus on individual, private ownership.

How are large-scale land conflicts dealt with?

In practice, many digitalization projects exclude such conflicts.

youth – who are among the most vulnerable rural groups – have not been given particular priority in the presented projects. In Rwanda, however, the new digital registry made it possible for women to also register land under their name individually or as co-owners alongside their husbands. The land-related digitalization processes add new challenges to rural communities and people, who are already facing multiple forms of violence and discrimination (e.g. lack of protection of tenure rights, limited access to justice, lack of digital and physical infrastructure to get tenure rights recognized, and lack of access to public support programmes). In the case of Georgia, for example, the implications of the digital (mostly rural-urban) divide are not assessed nor addressed under the project. What is more, the digitalization processes consolidate and deepen structural inequalities, as emphasized in particular in the cases of Brazil and Indonesia.

The major focus – implicitly or explicitly – of the land-related digitalization processes presented here lies on individual, private ownership. It remains unclear how the different digital tools and technologies can deal with other forms of tenure (i.e. collective and customary tenure rights and systems). In the case of Brazil, the digital registry SICAR was modified for the registration of collective ownership, but the registration numbers are extremely low and do not correspond to the amount of land that is under such tenure. The recognition, protection and promotion of all legitimate tenure rights and different forms of tenure is a key element of the Tenure Guidelines and a major issue in many countries. Not recognizing collective and customary tenure rights and systems in digital registries leads to the *de facto* exclusion and erasure of rural communities on their territories. Consequently, the systems entice rural communities to register their lands individually.

The digitalization processes in these case studies do not primarily address the most pressing tenure issues (e.g. land conflicts, land concentration, and lack of protection of tenure rights), despite some references to policy objectives such as improving tenure security, reducing rural poverty (e.g. Indonesia¹⁴² and Rwanda¹⁴³) or promoting sustainable economic development (e.g. Georgia). In practice, some digitalization processes even reproduce or deepen such issues. The underlying focus of many projects on exclusive, individual, and private ownership and on the promotion of land-based investments and markets, in fact intensifies existing tenure issues – especially land conflicts. For example, the case of Maranhão, Brazil, shows a close correlation between the introduction of digital land registries, the expansion of industrial agriculture, and increased violence and conflicts. It is also noteworthy that a few projects explicitly exclude areas that are subject to land conflicts (e.g. Indonesia). Moreover, in Rwanda, a project evaluation pointed out that rural poverty may increase as a result of the project as poorer households could see themselves forced to sell their land. Thus, the way these digital tools and technologies are used and the specific context in which they are deployed can create new forms of dispossession. Whereas registration in digital registries is promoted as a way for small-scale food producers to participate in support programmes (e.g. in Brazil), such registration is not as easy (as explained above) and often comes at the cost of individualizing tenure rights, rights that are often collective.

The lack of information on, and effective participation in, the design and implementation of land-related digitalization projects is another key problem identified in the described case studies. Rural people and their organizations are often not even aware of the digitalization processes and lack the knowledge on how to use and access digital technologies. Usually this is due to poor access to financial resources and the weak digital infrastructure in rural areas. Moreover, affected people and groups have no effective access to justice and judicial remedies in the context of land-related digitalization processes. The case of Brazil illustrates how digitalization can lead to situations where communities' struggles for justice and legal protection are further obstructed by an inversion of the burden of proof. Access to justice and remedy is further hampered by complicit (local) government institutions and/or lack of understanding of digital systems by the judiciary.

Digitalization processes in these case studies do not primarily address the most pressing tenure issues.

It should be noted that communities and rural organizations in several countries are using digital tools to advance their tenure rights. In Brazil and Indonesia tools such as satellite images are used to track land use change (in particular deforestation) and Brazilian organizations state that the digital registries make it easier to identify land grabs.¹⁴⁴ There are also efforts towards participatory mapping of rural communities' lands using digital tools (especially in Indonesia). However, the recognition by authorities of these produced maps remains limited and communities' maps often collide with official maps. The overall environment thus puts serious limitations on the possibility of making these bottom-up approaches effective.

Policy and legal frameworks

All the case studies point to structural problems in existing policy and legal frameworks related to tenure. All the countries have serious tenure issues, which are – at least in part – related to the existing regulatory frameworks and/or lack of effective implementation. As mentioned before, the particular lack of effective legal protection of rural peoples' and communities' tenure rights is a critical issue in almost all the countries. This situation underscores that digitalization in itself is not a solution to pressing tenure issues and must include processes that revise policy and legal frameworks based on and supportive of human rights.

Another critical aspect is that the full implementation of land-related digitalization processes often requires substantial legal changes – especially for the application of (partly) automated land administration and transfers (e.g. in relation to blockchain and 'smart contracts'). For example, in Georgia the envisaged land transfer system uses the Bitcoin blockchain which poses a problem as the current law requires registries to be public (i.e. state owned). Moreover, the introduction of smart contracts that would operate in a global 'decentralized cyberspace' would conflict with Georgian law because land services have to be carried out within Georgia. This scenario emphasizes that legal changes for the application of land-related digital tools are highly sensitive, as they cannot exclude basic democratic principles in relation to the control of land and peoples' right to self-determination (Art. 1 ICESCR). This implies that changes in policy and legal frameworks have to be developed through processes that ensure meaningful and effective participation of all those who might be affected.

The case studies did not look in depth into existing ICT-related frameworks, but it should be noted that these may have considerable impacts on land-related digitalization processes. In several countries regulation of ICT is still in development, but land is not necessarily considered in such processes and debates, although it is very relevant. In this regard, common issues concern data ownership, privacy, and security but also the collection, storage and processing of data, as well as the ownership and control over the digital infrastructure (which is usually privately-owned). The case of Georgia points to some of the problems that could arise due to land transactions using private infrastructure (blockchain) and that the digitalization process is largely dependent on a private company. This creates serious concerns about (national/state) sovereignty over public data as well as over public policies.

Administration of tenure

Increasing efficiency of land administration, as well as reducing fraud and corruption, are among the major arguments put forward by proponents of digitalization in the context of land. However, the case studies show mixed outcomes. The process of identifying and recording tenure rights in Andhra Pradesh in India has created new entry points for corruption due to the lack of effective prevention mechanisms. The

Digital (Automatized) Land Transactions– 3 Critical Questions



In practice, the focus usually lies on the promotion of land markets and investment projects. Support to equitable access and distribution to land (including through restitution and redistribution) is not envisaged.

What are the main objectives?

Does digitalization solve problems of corruption and fraud?

In practice, digitalization is no silver bullet to end corruption, land grabs and fraud.

What changes to legal frameworks are necessary?

In practice, digitalized/automatized land transactions require significant changes to legal frameworks, which risk to further marginalize rural people and their rights.



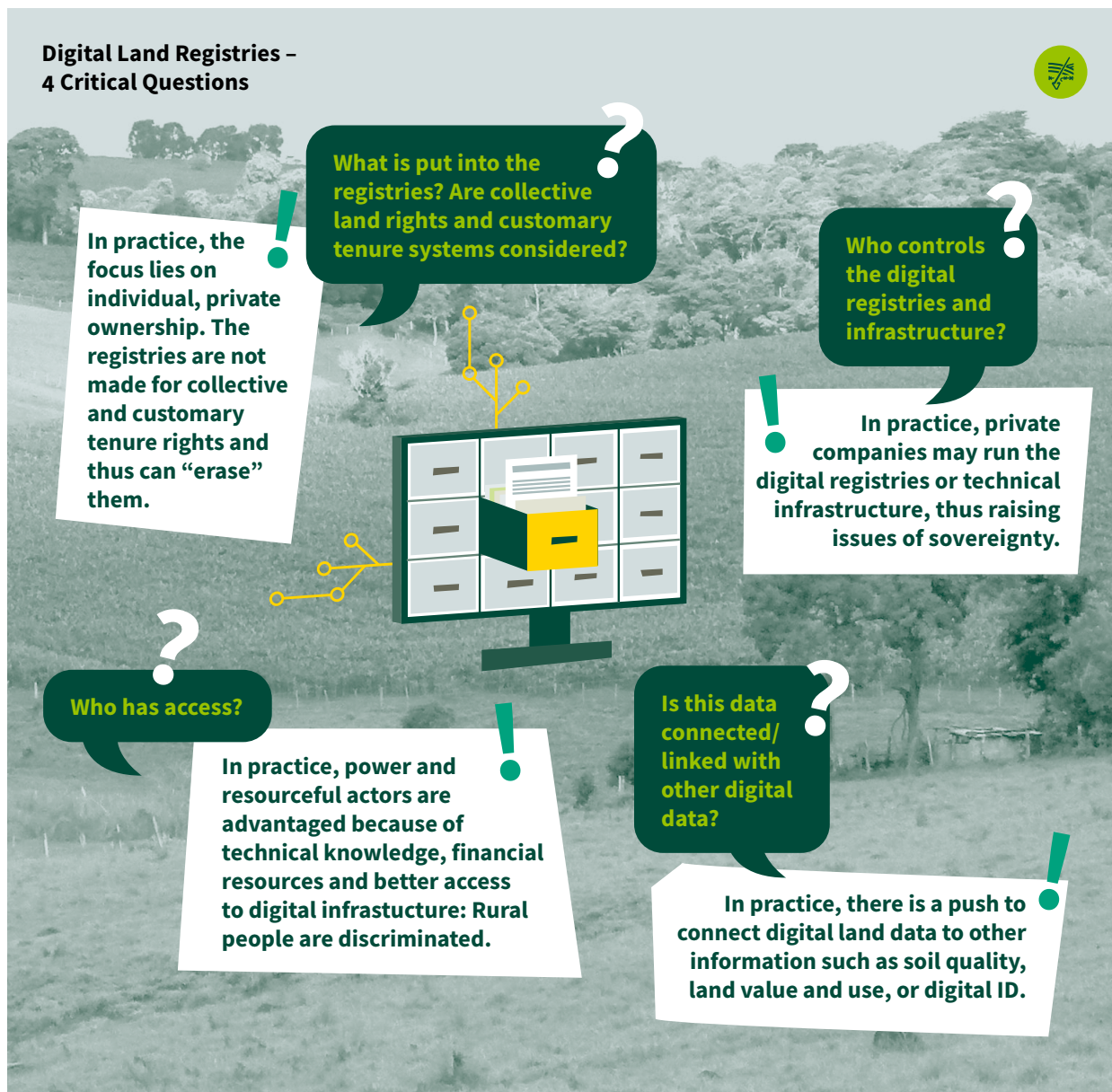
case of Brazil underscores that the use of digital technologies does not impede fraud and corruption, especially due to the self-declaratory nature of digital registries and lack of effective monitoring and verification.

This points to an additional issue, namely the lack of sufficient resources around land administration in general, and in relation to land-related digitalization processes in particular. A part of the problem in Brazil is that the responsible authorities do not have the means (in terms of knowledge and budget) to monitor the digital registries and assess/verify the self-declared entries. In addition, the existence of several unconnected registries leads to serious discrepancies and confusion regarding land tenure, which plays out in favour of powerful actors. Identifying and addressing discrepancies in the different registries would require enormous resources, which are (currently) not available. The availability of sufficient technical and financial resources for land administration agencies is already a problem in many countries and locations. Georgia is another example which shows that the use of ICT requires substantial additional resources, thus raising questions about the increased efficiency that proponents of digitalization assert.

In many instances lack of digital infrastructure, necessary capacities to operate the systems and/or technical knowledge – in particular in rural areas – impedes the use of digital land administration tools. Local judges' lack of technical knowledge of

Particular lack of effective legal protection of rural peoples' and communities' tenure rights is a critical issue in almost all the countries.

Digital Land Registries – 4 Critical Questions



Lack of digital infrastructure, necessary capacities to operate the systems and/or technical knowledge – in particular in rural areas – impedes the use of digital land administration tools.

the functioning of the digital registries in Brazil can contribute to further land dispossession of rural people. State officials often lack the necessary capacities to operate the systems, as the example of Rwanda illustrates. The case of Rwanda further shows that state authorities’ lack of sufficient resources and infrastructure leads to a situation where a parallel, informal system for land transactions is maintained by local people – transactions that should already be operating via the formal digital administration system. Transfers of tenure rights are thus often not recorded in the digital system, creating further discrepancies between the registration systems and the reality. This situation entails the risk of creating new conflicts, especially among those poorer groups which avoided costly systems.

The difficulties that rural communities and (in some cases) local authorities have when trying to access and use the digital systems underlines the lack of socio-cultural appropriateness. The Tenure Guidelines call for the application of ‘locally suitable technology’ (para. 17.4) and socio-culturally appropriate ways of recording tenure rights (para. 17.2). The inability of the described digital systems to adequately record collective and customary tenure rights and systems points to their limited socio-cultural appropriateness. This also points to the fact that land administration cannot be separated from the inherently political aspects of land governance. Lack of recognition of rural communities’ tenure rights and systems

is a critical, structural issue in many countries. Which lands are mapped and demarcated by whom and in what way, and how they are then registered are highly contentious issues. In particular, Brazil and Indonesia are examples that show that land-related digitalization processes not only replicate existing forms of exclusion, but may even create a new, digital ‘reality’, which does not reflect the real situation on the ground. This entails (potentially) a re-definition of ownership rights, based on what is (or what is not) in the digital system.

Transfers of tenure rights

Promoting land-related ‘investments’, facilitating land transactions, and creating or fostering ‘efficient’ land markets are key objectives of most of the digitalization processes described here. In some cases, these are the explicit objectives of projects (e.g. Georgia); in others, digitalization happens in a broader context of corresponding policies. The case of Maranhão in Brazil is a clear example of how digital tools are used by agribusiness companies, wealthy individuals and local elites in the context of state-supported expansion of the agro-industrial frontier of commodity production. An example is Indonesia which shows that digitalization, combined with new, ‘sustainable’ financing models, aggravates dispossession for rural communities. The case studies point to a generalized lack of adequate and effective safeguards to protect the rights of marginalized people.

From a human rights perspective, it is at least equally important to note that the promotion of equitable access to and distribution of land, including through measures such as restitution and redistribution, are not part (or at least not a relevant part) of digitalization processes, although these are key for human rights-based governance of tenure, as recognized by the Tenure Guidelines. In Indonesia, the digitalization process is linked to the government’s agrarian reform policy. However, the example shows that this alone does not impede further dispossession. Moreover, the project in Indonesia explicitly excludes land areas with overlapping land claims or conflicts. Overall, the case studies show that land-related digitalization processes carry serious risks for increasing land grabs, dispossession and land concentration in the hands of powerful actors.

Promoting land-related ‘investments’, facilitating land transactions, and creating or fostering ‘efficient’ land markets are key objectives of most of the digitalization processes described here.

V. Conclusion and Recommendations

Land is a highly political issue which is closely related to power imbalances and often reflects structural discrimination against marginalized groups.

Key issues of the digital economy, such as the private nature of most digital infrastructure, a highly concentrated ICT sector and issues related to the collection, ownership and use of data, are also highly relevant in the context of land.

As the findings of the research show, digitalization in the context of land is well underway in different forms and in all parts of the world, and has concrete impacts on the access to, control over, and use of land. Human rights issues arise at different levels of the digitalization processes: the mapping and demarcation of land with digital tools; the storage of land-related data in digital registries; and the carrying out of land transactions and decision-making based on digital information and processes. As stated before, it is important to acknowledge that land is a highly political issue which is closely related to power imbalances and often reflects structural discrimination against marginalized groups. Therefore, land-related digitalization processes need to be part of a coherent set of policies aimed at overcoming the structural causes of such discrimination, social injustice as well as hunger and malnutrition. In addition, the application of digital technologies in the context of land needs to be seen in the broader context of the use of ICT more generally. Therefore, key issues of the digital economy, such as the private nature of most digital infrastructure, a highly concentrated ICT sector and issues related to the collection, ownership and use of data, are also highly relevant in the context of land.

The use of digital tools has the potential to contribute to improving land governance, but there are also considerable risks. The case studies in this paper clearly show that land-related digitalization processes are not generally embedded in human rights. The consequence is that, instead of addressing them, these processes reproduce, consolidate and even exacerbate existing forms of exclusion and marginalization. In order to make sure that the application of digital tools, technologies and platforms can support responsible governance of land, digitalization processes need to be solidly anchored in the human rights framework. The Tenure Guidelines, as well as other human rights standards, such as the right to food and nutrition, the right to adequate housing, the UNDROP, UNDRIP, ILO Convention 169 and CEDAW General Recommendation No. 34, provide crucial guidance in this regard and should therefore be used as key references in the context of land-related digitalization processes and initiatives.

On the basis of our findings, we recommend that states and intergovernmental organizations – including development cooperation agencies – should:

- Ensure that land-related digitalization processes are embedded in human rights-based tenure policies. In particular, they should:
 - Put particular emphasis on marginalized people, taking into account their rights and needs;
 - Respect, protect and promote all legitimate tenure rights as well as different forms of tenure, especially collective and customary tenure and management systems;
 - Guarantee effective participation of all tenure rights holders at all stages of the digitalization process, in particular marginalized people and (rural) people's organizations;
 - Ensure that land-related digitalization processes are supportive of broader policy objectives such as the realization of the right to food and nutrition, poverty eradication, social stability and justice, rural development, as well as the sustainable use of land and related resources.

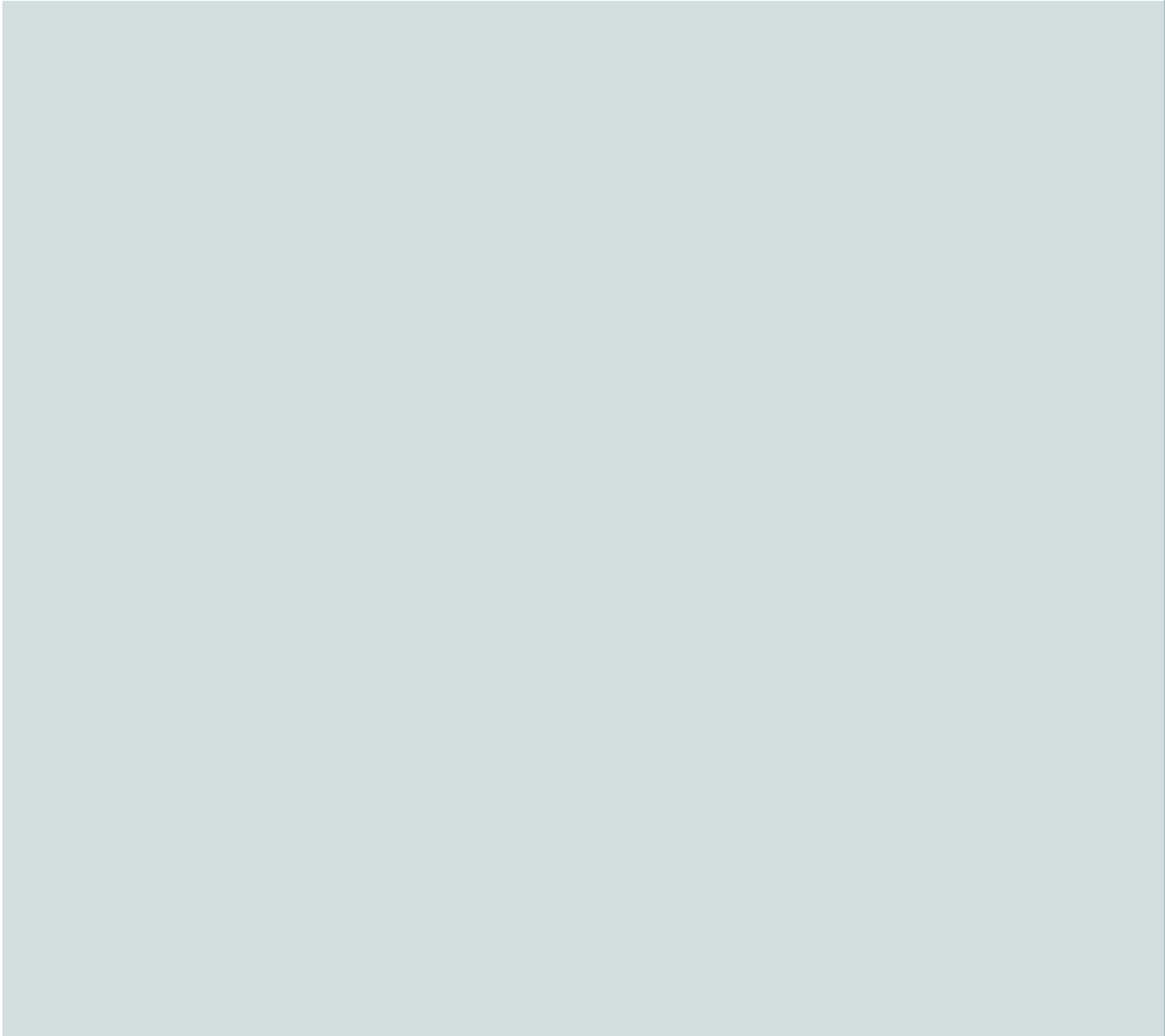
- Put in place adequate and effective mechanisms to carry out comprehensive human rights impact assessments and to monitor digitalization processes and their impacts. Such mechanisms should be human rights-based and ensure effective participation of marginalized people and (rural) people's organizations. Assessments should involve independent experts/bodies and their results should be made public and inform measures to prevent, cease and remedy harm.
- Ensure that policies related to the development and use of digital technologies are based on human rights (in accordance with the Roadmap for Digital Cooperation proposed by the UN Secretary General).¹⁴⁵ This includes, in particular, putting in place regulatory frameworks to ensure:
 - Non-discrimination and effective measures to address the 'digital divide', including its rural and gender dimensions;
 - Socio-cultural appropriateness of the development and use of digital technologies;
 - Data security and privacy as well as effective protection against the illegitimate appropriation of data and the benefits arising from its use;
 - Accountability of private actors involved in the development and use of digitalization processes, including in the context of public-private partnerships;
 - Public interest control over 'non-personal data', including ensuring storage and processing as close as possible to data sources, cloud neutrality, and the promotion of publicly controlled clouds.
- Initiate and/or support processes ensuring broad participation of the public (in particular by marginalized people and their organizations) to collect views regarding the use of digital technologies in the context of land and food. Such processes should inform the further development of digitalization processes and include:
 - Increasing the capacities of food producers and (rural) peoples' organizations regarding the use of digital technologies and its implications so that they can develop their own vision and proposals in this regard;
 - Conducting additional research and consultations to develop human rights-based and public interest-centred models of governance in the context of digital technologies. Key issues include public interest control over digital data and infrastructure; the definition and upholding of data-related legal economic rights – individual and collective – for the data source and subject (rights holders); as well as the promotion of digital public goods.

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 - 37 The National Institute of Colonization and Land Reform (Instituto Nacional de Colonização e Reforma Agrária, INCRA) is responsible for land reform, establishing rural settlements, maintaining rural cadasters (SNCI, SNCR, and SIGEF), and managing of public lands, regularization and titling of quilombolas. The Brazilian Forest Service (Ministry of Environment) is responsible for public forest concessions, managing the National Public Forest Registry and implementing the SICAR.
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- 44 MATOPIBA encompasses over 73,173,485 hectares adjacent to areas from three states in northeastern Brazil (southern Maranhão, western Bahia, and southwestern Piauí) and one state from the northern region (eastern Tocantins). It is a territorial delimitation that the Brazilian government created by decree (No 8.447) in 2015 in order to designate the area for the development of agricultural and mining activities.
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