A PLEA FOR A BOTTOM-UP, BRUTE-FORCE SOLUTION

Land Administration Census

The battle against poverty in developing countries has always been associated with the issue of land. Since the turn of the millennium, the focus has been on facilitating the official registration of land rights by the poor and the vulnerable. Many countries in sub-Saharan Africa still lack a well-functioning land administration system, notwithstanding many dedicated aid programmes. Such programmes were designed by Western institutions and often copied Western land administration architectures. In this article, the author advocates a bottom-up approach using census-taking as a paradigm. First the capabilities of advanced technologies are identified, then the way aid is brought to the vulnerable is explored and lastly an approach based on conducting population and housing censuses in sub-Saharan Africa is considered.

It is generally recognized that the right of individuals or groups to own land and to reap its fruits is a key driving force for prosperity of a society as a whole. Ownership brings the obligation of custody and stewardship. Owing land is a fundamental human right. Article 17 of the Universal Declaration of Human Rights – adopted and proclaimed on 10 December 1948 – declares that (1) everyone has the right to own property alone as well as in association with others, and that (2) no one shall be arbitrarily deprived of his property. But how do others know of an individual's or a group's rights to land?

▲ *Figure 1: Trimble TDC100 handheld data collector combines smartphone and GNSS technology.*

INNOVATIVE LAND TOOLS

To avoid conflicts, it is essential that the types of right, the subjects who hold the rights and the objects themselves, i.e. the pieces of land, are clearly identified and registered, and the rights are acknowledged and protected by the authorities. This is where land administration comes in. It is a complex process with many actors and stakeholders. It involves the generation of legally valid documents, measurement of the parcel boundaries and (georeferenced) documentation of these measurements. Many developing countries do not have a well-functioning land administration system in place, notwithstanding many aid programmes which are focused on securing land tenure. These programmes were designed by Western institutions and often copied Western land administration architectures. In sub-Saharan Africa progress is modest, leaving farmers and others vulnerable to land disputes, land grabbing and decreasing yields.

To speed up the process of safeguarding property rights, much hope is focused on the abilities of advanced technologies and innovative land tools related to the concepts of 'pro poor', 'fit for purpose' and continuum of land rights. However, technology is just one side of the coin. The other side concerns matters such as the architects of the solution and the design principles. The solutions are often based on a template that has been designed in a developed part of the world. However, because conditions vary from country to country, the implementation of a template derived from systems which work well elsewhere has been proven to be inappropriate.

TECHNOLOGIES

The individual parcel is the key entity in any land administration and cadastral system. A boundary survey of individual parcels actually means measuring the coordinates of the points along the edges of the parcel where the direction of the border deviates from a straight line. Next, a continuous boundary is reconstructed by connecting the corner points. In the wake of the advancements in microelectronics and computational power, land surveying technologies have changed drastically since the 1950s. Total stations and high-end GNSS receivers – the workhorses of land surveyors – have been accompanied by multiple sensor systems which can be mounted on nearly all types of moving platforms, including

Figure 2: UAS equipped with camera as tool for cadastral boundary survey (courtesy: M. Lemmens).

human backs and hands. The main sensor systems are based on cameras and laser scanners (Lidar) supported by GNSS and miniaturized inertial navigation systems. Produced at low costs, consumer-grade smartphones are increasingly being equipped with such sensors. This opens up new possibilities to involve land owners and other rightsholders more intensively in the land administration process; currently, their role entails merely pointing out the corners of parcels, after which a land surveyor carries out the time-consuming boundary survey job. Indeed, the possibilities and capacities to capture cadastral boundaries are huge today. Smartphones equipped with high-accuracy GNSS capabilities are becoming increasingly affordable and user-friendly, potentially enabling millions of laymen to become amateur surveyors (Figure 1). Optical satellite images have such a high ground sample distance (GSD) that boundaries can be delineated with a relative precision at decimetre level. Unmanned aerial systems (UASs or 'drones') can be equipped with cameras, making it possible to create accurate ortho images of a village and surrounding fields within a couple of days using dense image matching software (Figure 2). The local population, supported by a trained person, can delineate property boundaries on these images. The data can be processed in temporary offices thanks to the internet, wireless communication and the opportunities of cloud computing. Research conducted all over the world has shown that high-resolution optical satellite images, UASs and smartphones can all help to speed up the land administration process.

HANDHELDS EQUIPPED WITH GNSS AND GIS COMBINED WITH IMAGERY SUPPORT THE IDENTIFICATION OF LAND RIGHTS AND BOUNDARY DELINEATION

PARTICIPATORY LAND ADMINISTRATION

The above-mentioned sensors and new capabilities enable what is called participatory land administration (PLA). This means that the owners come together and agree about who owns which piece(s) of land. They then record the boundaries with devices including smartphones and data sources such as ortho-rectified satellite images or orthomosaics created from images captured by UAS-mounted cameras. The initial establishment of a land administration system requires the existing land rights to be officially recognized and recorded. This process, called adjudication, does not concern vesting land rights – they already exist – but focuses instead on authoritatively ascertaining the rights. A carefully conducted adjudication process creates security of rights. An early study of the role of PLA in speeding up the adjudication process was conducted by Lamptey (2009) in Ghana. She found that the use of handhelds equipped with GNSS and GIS software combined with satellite imagery effectively support the identification of land rights and boundary delineation (Figure 3). Later research conducted by Asiama et al. (2017), also carried out in Ghana, confirmed the findings, although the exact delineation on satellite images sometimes faced difficulties because of occlusion by vegetation. Figure 4 shows the results of boundary surveys carried out using smartphones (red) and high-resolution satellite images (blue).

TOP-DOWN APPROACH

Securing land tenure helps to reduce poverty among farmers and other entrepreneurs because it stimulates custody and stewardship. Who should design, develop and implement the necessary measures and

provisions to arrive at secure land tenure? How should it be organized and who should be in charge? How should the endeavour be financed? Time after time, it has been demonstrated that solutions conceived by developed countries and often based on Western concepts do not achieve the intended improvements. The main reasons are that legal systems and the relationships between humans and land are embedded in a historical and cultural context. The technologies and workflows that work well in one society cannot necessarily be copied and directly applied to another. The idea that such a transfer would work is a long-standing misconception.

The effects of foreign aid on improving the living conditions of the poor in developing countries has been intensively investigated. Despite the best of intentions, aid often does more harm than good. This is because the aid-giver not only provides financial support and contributes expertise, but also defines the aid and determines the manner in which it is executed in line with the adage, 'he who pays the piper calls the tune'. Based on his research Easterly (2006), who spent most of his career as an economist at the World Bank, criticizes foreign aid delivered by the rich part of the world to the poor part. He argues that "aid does not work since it is provided in the context of ambitious plans based on generosity; a planner thinks he already knows the answers". Planners take a top-down approach, whereas the poor need bottom-up solutions. Since the poor themselves know best in terms of what they need, they should be allowed to come up with the solutions; they do not need Western architects who devise solutions on a drawing board somewhere in the USA or Europe. Up to now, the sum of all plans is negative, he states, and that is because aid money does not actually reach the poor, and when goods and services purchased with donor money do reach them they are not used properly.

AID DOES NOT WORK SINCE IT IS PROVIDED IN THE CONTEXT OF AMBITIOUS PLANS BASED ON GENEROSITY; A PLANNER THINKS HE ALREADY KNOWS THE ANSWERS

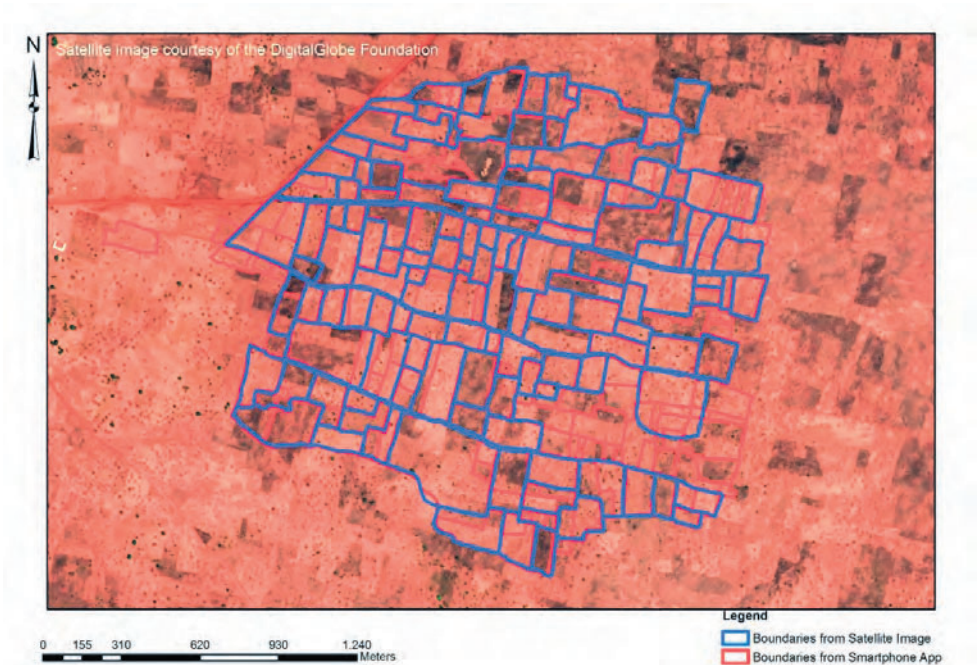
MOZAMBIQUE

A recent example of a top-down approach in the context of land administration is the Terra Segura (Secure Land) Mozambique Land Administration Project, which is financed by the World Bank Group with a loan of US$100 million issued at the end of 2018. In Mozambique, land rights for about 90% of the total occupations have not been formally registered. The project is aimed at improving tenure security as well as the land administration system. This requires institutional upgrading and capacity building. The project will cover 1,200 communities across the country and benefit 700,000 rural rightsholders, equating to around 12% of the country's rural population (Figure 5). In addition to the construction of provincial and regional offices, ICT equipment will be procured, high-resolution orthorectified satellite images acquired, and parcel demarcation and boundary surveys outsourced. Task team leadership and technical aspects will be managed from the World Bank's office in Washington, USA, in close collaboration with the country office in Maputo, Mozambique's capital. The overall risk of the project has been classified as substantial. The urgent need for this project has arisen due to the eagerness of foreign investors to acquire large pieces of land, an interest which is stimulated by the national government and the agricultural industry. Confronted with irreversible deprivation, the rural population is putting up fierce resistance but is unaware of the underlying processes. It is hoped that increasing tenure security will prevent such land-grabbing activities by foreign investors. This four-year project is not only being controlled from an office in the West, but is actually involving 12% of the

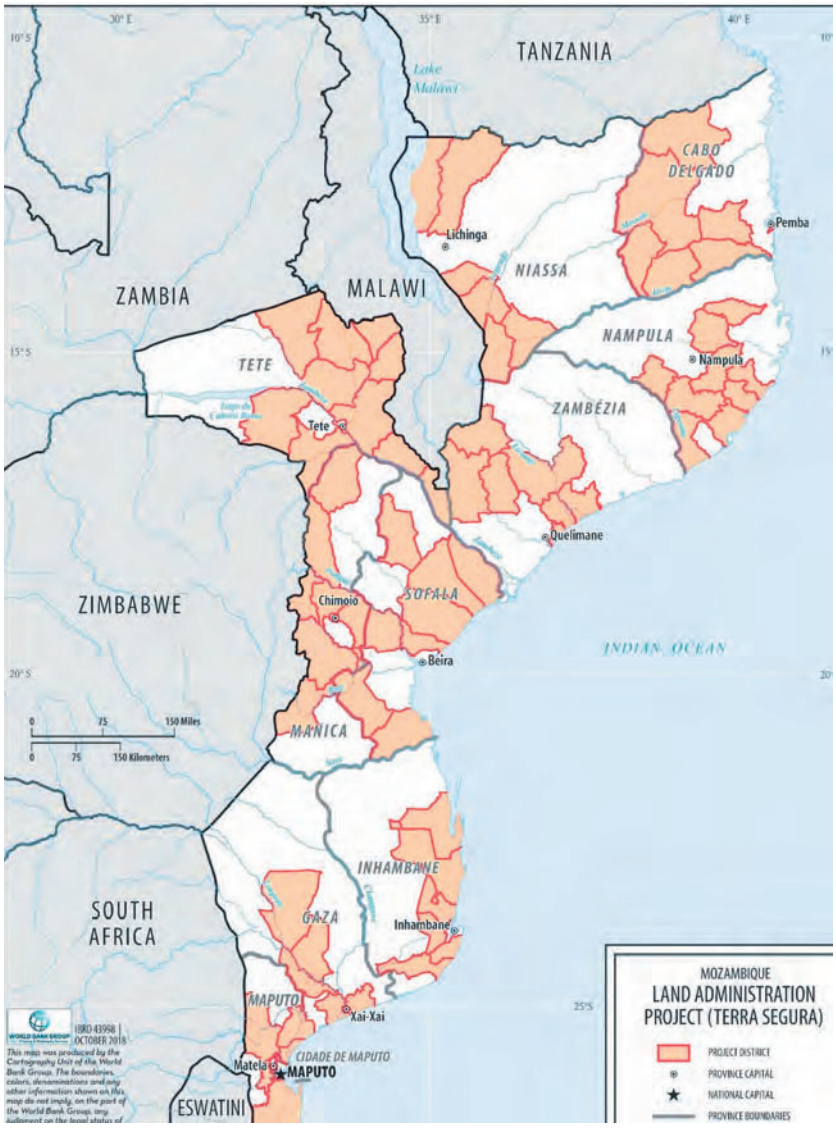
AMENABILITY

The ideas proposed in this article go back a long way. The first notions originate from a land administration project carried out in Estonia in the 1990s. Related issues have featured regularly in the nearly 200 columns I have written for this publication since then. Some readers might even have thought that I've become philosophical – but it has always been about injustice, the imbalance of power and unjustifiable poverty.

Figure 3: Boundary survey using a handheld (left) and satellite map (source: Lamptey, 2009).



▲ *Figure 4: Parcel boundaries collected from satellite map and by smartphone (source: Asiama et al., 2017).*



▲ *Figure 5: Terra Segura project districts in Mozambique (source: World Bank, Report No: PAD2919, 2018).*

rural population, as mentioned above . As a result, it is expected to take 30 to 40 years to cover the entire country.

CENSUS

The Mozambique example outlined above shows that covering an entire country with tenure security may take decades, even when using advanced technologies such as aerial or satellite imagery or smartphones equipped with positioning apps. In many sub-Saharan countries, however, other huge projects involving the entire country have been undertaken rather successfully within time spans of less than a decade. These projects are closely related to population and housing censuses. A census is a large-scale, comprehensive and complex undertaking as preparing for, collecting and processing the massive amount of data places huge demands on resources in terms of manpower, training, technology and funding. It is said to be one of the biggest peacetime operations in terms of planning, funding, logistics and execution, affecting as it does the entire population living within the territory. Producing detailed statistics for small areas and small population groups is the foundation of any population and housing census, and to arrive at such statistics it is necessary to collect data concerning composition, characteristics, spatial distribution and organization.

The different census methods can be subdivided into: (1) group assembly method; (2) self-response method; (3) direct interview/canvasser method; and (4) virtual census. In developing countries, the canvasser method is usually used, because the other methods require a high level of literacy among the population. The canvasser method is a de facto method whereby every individual physically present in the country is interviewed face to face. This is the most reliable but also the most expensive and demanding method because it requires extensive preparation, training of hundreds of thousands of enumerators, adequate communication and a fine-grained command hierarchy.

BOTTOM-UP APPROACH

Adjudication carried out in sub-Saharan countries is often criticized because of limited transparency and lack of participation of the land owners and other stakeholders. In line with the ideas of Easterly, the success rate depends on a bottom-up approach in

which the main stakeholders are convinced that officially registering land rights brings benefits to the owners and society as a whole. Being convinced is maybe not enough; people should also be enthusiastic and willing to make sacrifices. Census-taking provides a paradigm for the manner in which such a huge endeavour can be organized and streamlined. A first requirement is that the endeavour should be organized bottom-up, with the financial support and expertise of donor organizations. A second requirement is a sophisticated publicity programme addressing the entire population. A third requirement is that hundreds of thousands of indigenous literates are trained for fieldwork. As the example of Mozambique shows, organizations are willing to provide financial support. Of course, all the solutions proposed and investigated in the past should not be thrown in the waste bin. For example, capacity building is a key pillar for success. Participatory land administration has proven to be effective for motivating and inspiring land owners. Today, information and publicity can reach every nook and cranny of a country. The technology is in place. Now it is all about bundling the abilities, converging energy and creating a willingness to undertake the mission. A bottom-up approach of such dimensions and impact will require a 'brute-force approach' – but that does not mean that it should be accompanied by military missions or physical force. Furthermore, the endeavour can be founded on three sound concepts: pro poor, fit for purpose and continuum of rights.

CONCLUDING REMARKS

The proposed approach will be confronted with many complex factors which may be beyond the scope of control. However, the main pillar for success will be the bottom-up approach in which governments, land owners, traditional leaders and other stakeholders join forces in the firm conviction that everyone will benefit and that their efforts will mark a turning point for a new era, a better future. If it is possible to organize a nationwide population and housing census, with all the painstaking preparation and setbacks it entails, surely it is also possible to organize a nationwide land administration census? It is worth at least considering the opportunities. ◂

FURTHER READING

Asiama, K., Bennett, R., Zevenbergen, J. (2017) Participatory Land Administration on Customary Lands: A Practical VGI Experiment in Nanton, Ghana, *ISPRS International Journal of Geo-Information*, 6, 186.

Easterly, W. (2006) *The white man's burden: why the West's efforts to aid the rest have done so much ill and so little good.* The Penguin Press, New York, NY, 436 p.

Lamptey. F. (2009) Participatory GIS tools for mapping indigenous knowledge in customary land tenure dynamics: case of Peri-urban Northern Ghana. MSc thesis, International Institute of Geo-information and Earth Observation (ITC), Enschede, The Netherlands (Supervisors: M. Lemmens, A. Tuladhar, A. Arko-Adjei).

Lemmens, M. (2011) *Geo-information: Technologies, Applications and the Environment*, Chapter 13 (Census Taking) & Chapter 15 (Land Administration), Springer.

ABOUT THE AUTHOR

Mathias Lemmens is director of MSc Geomatics for the Built Environment, Delft University of Technology, the Netherlands, and an independent geomatics consultant. As team leader and GIS advisor he has conducted major EU and World Bank projects in Estonia, Nigeria and Kenya.

✉ m.j.p.m.lemmens@tudelft.nl

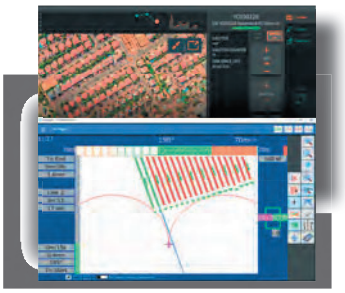
PHASEONE INDUSTRIAL

Complete Aerial Photography Solutions

From Flight Planning to Image Delivery

Plan with iX Plan

Fly with iX Flight & iX Capture



Capture with our Cameras & Systems

Process Images with iX Capture

industrial.phaseone.com