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Academic Publications

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This document overviews the publications stemming from the activities of Work Package 2, 'Get Needs'.

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Contributors: Serene Ho and Joep Crompvoets

Its 4 Land
Hengelosestraat 99
Enschede 7500AE

Netherlands
Phone: +31534874532
www.its4land.com

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The its4land consortium consists of the following partners:

University of Twente (UT)
KU Leuven (KUL)
Westfaelische Wilhelms-Universitaet Muenster (WWU)
Hansa Luftbild AG (HL)
Institut d'Enseignement Superieur de Ruhengeri (INES)
Bahir Dar University (BDU)
Technical University of Kenya (TUK)
ESRI Rwanda (ESRI).

Its 4 Land
Hengelosestraat 99
Enschede 7500AE
Netherlands
Phone: +31534874532
www.its4land.com

Executive summary

Its4land is a European Commission Horizon 2020 project funded under its Industrial Leadership program, under an ICT call (H2020-ICT-2015) with the topic of 'International partnership building in low and middle income countries'. its4land combines an innovation process with emerging geospatial technologies, including smart sketchmaps, UAVs, automated feature extraction, and geocloud services, to deliver land recording services that are end-user responsive, market driven, and fit-for-purpose. The transdisciplinary work also develops supportive models for governance, capacity development, and business capitalisation.

This document, Deliverable 2.6 (D2.6), is the final deliverable report for 'Work Package 2 (WP2) – 'Get Needs' of the its4land project. It provides an overview of academic publications produced, or in the process of being produced, as a consequence of the research activities of WP2. There are four types of publications:

- peer-reviewed journal publications
- peer-reviewed conference proceedings relevant to the research domain
- reports to industry in the research countries
- higher degree dissertations.

An abbreviated abstract is provided for articles that have been accepted for publication and a brief description is provided for articles under review.

Contents

Abbreviations

CLGE	Council of European Geodetic Surveyors
FIG	International Federation of Surveyors
GIS	Geographical Information System
ISI	International Scientific Indexing
SKMO	Southern Kenyan Maasai Ontology
SME	Small and Medium Enterprises
UAV	Unmanned Aerial Vehicle

1. Introduction

Its4land is a European Commission Horizon 2020 project funded under its Industrial Leadership program, specifically the 'Leadership in enabling and industrial technologies – Information and Communication Technologies ICT (H2020-EU.2.1.1.)', under the call H2020-ICT-2015 – and the specific topic – 'International partnership building in low and middle income countries' ICT-39-2015.

Its4land aims to deliver an innovative suite of land tenure recording tools that respond to sub Saharan Africa's immense challenge to rapidly and cheaply map millions of unrecognized land rights in the region. ICT innovation is intended to play a key role. Many existing ICT-based approaches to land tenure recording in the region have failed: disputes abound, investment is impeded, and the community's poorest lose out. its4land seeks to reinforce strategic collaboration between the EU and East Africa via a scalable and transferrable ICT solution. Established local, national, and international partnerships seek to drive the project results beyond R&D into the commercial realm. its4land combines an innovation process with emerging geospatial technologies, including smart sketchmaps, UAVs, automated feature extraction, and geocloud services, to deliver land recording services that are end-user responsive, market driven, and fit-for-purpose. The transdisciplinary work also develops supportive models for governance, capacity development, and business capitalization. Gender sensitive analysis and design is also incorporated. Set in the East African development hotbeds of Rwanda, Kenya, and Ethiopia, its4land falls within TRL 5-7: 3 major phases host 8 work packages that enable contextualization, design, and eventual land sector transformation. In line with Living Labs thinking, localized pilots and demonstrations are embedded in the design process. The experienced consortium is multi-sectorial, multi-national, and multidisciplinary. It includes SMEs and researchers from 3 EU countries and 3 East African countries: the necessary complementary skills and expertise is delivered. Responses to the range of barriers are prepared: strong networks across East Africa are key in mitigation. The tailored project management plan ensures clear milestones and deliverables, and supports result dissemination and exploitation: specific work packages and roles focus on the latter.

This document, Deliverable 2.6 (D2.6), is the final deliverable report for 'Work Package 2 (WP2) – 'Get Needs' of the its4land project. It provides an overview of academic publications produced stemming from:
- the activities of WP2
- the application of the knowledge gained under WP2 in support of other its4land work packages
- the application of the knowledge gained under WP2 in support of other external research projects in the domain of land administration.

WP2 has produced, or is associated with the ongoing production of, four types of publications:

- peer-reviewed journal publications (typically those targeting high impact journals included in the international scientific indexing)

- peer-reviewed conference proceedings relevant to the research domain, prioritised for dissemination and communication purposes
- reports to industry in the research countries (including research participants and valorisation panels)
- higher degree dissertations.

2. Academic Publications

The publications produced, or is in the process of being produced, as part of the research activities of WP2 are listed here. The publications are organised under the four main types of publications:

- journal articles
- peer-reviewed conference proceedings
- industry reports
- dissertations (in a supervisory role).

An abbreviated abstract is provided for articles that have been accepted for publication and a brief description is provided for articles under review.

2.1 Journal articles

Academic publications intended for publication in peer-reviewed journals aim to be published in high-impact journals of relevance to the domain of land administration. Journals included in the International Scientific Indexing (ISI) are prioritised.

Under preparation

Ho, S., Crompvoets, J., Broucker, B. and Pattyn, V. Application of the Nominal Group Technique for stakeholder needs assessment in land administration: the 'its4land' project. *To be submitted to Land Use Policy*.

This article describes the main methodology adopted in WP2 and the application to the field of land administration.

Ho, S. and Crompvoets, J. "Squatters on their land": urbanisation, Maasai culture and perceptions of tenure security in Kajiado County in Kenya. *To be submitted to Habitat.*

This article presents the various perceptions of the local Maasai community in Kajiado, Kenya, on the impact of urbanisation on tenure security on their land.

Ho, S. and Crompvoets, J. Technological innovation in land administration: a comparison of Rwandan and Ethiopian stakeholders in the its4land project. *To be submitted to International Journal of Urban and Regional Research.*

This article describes the case study findings of WP2 with regards to Ethiopia and Rwanda.

2.2 Peer-reviewed conference proceedings

These publications have been peer-reviewed and accepted for presentation and inclusion in conference proceedings. Typically, conferences relevant to land administration have been targeted mainly those organised by the International Federation of Surveyors (FIG) and the World Bank. Acceptance into these conferences are competitive. Other geospatial or governance related conferences have also been considered. Abbreviated abstracts are provided where available. In the first year of the project, which WP2 was mainly active, conferences were a quicker dissemination and communication channel to profile the project.

Accepted

Ho, S., Crompvoets, J. and Steen, T. (2018). Co-production and co-creation of responsible land administration: insights into potential prospects and pitfalls from the 'its4land' project. Proceedings of 19th Annual World Bank Conference on Land and Poverty, 19–23 March, Washington, DC, USA.

Abstract: This paper considers the question as to what extent third-generation land tools enable co-production and hence, co-creation of responsible land administration. It applies the concepts of co-production and co-creation from public administration to consider to what extent third generation land tools, like its4land tools, deliver, on the promise of responsible land administration by supporting participatory and inclusive use of new technologies in land tenure recording. The data is used to build an argument that, although the co-productive proposition of third generation land tools is reinforced, what this actually means is not entirely clear, and how this leads to value creation even less so. It appears that the structure of co-production is being technologically driven rather than needs driven and risks becoming a consequence of imitation, or worse, coercion, reinforcing old biases in new ways. In turn, this threatens the very value of responsibility that these tools propose to deliver.

Fairlie, K., Pichel, F. and Ho, S. (2018). What do communities want from land reform? A socio-technical exploration of community-led land rights documentation projects. Proceedings of 19th Annual World Bank Conference on Land and Poverty, March 19 – 23, Washington, DC, USA.

Abstract: This paper aims to contribute to furthering understanding of the social, institutional and political questions that fundamentally impact success and sustainability of technological interventions to improve the scale and quality of land tenure documentation. It focuses on the context of community-led land rights documentation projects, which are becoming more widespread and therefore, mechanisms and processes by which such initiatives can be incorporated within, or linked to the formal system becomes increasingly significant. The paper develops an analytical assemblage framework to support the representation and interrogation of the complex, multi-dimensional connections and disconnections between the actors, structures, technologies and 'things' with respect to local-level land administration activities. This will primarily draw out a greater understanding of the socio-institutional aspects that may drive land reform success and sustainability at the local level, and what may facilitate or limit interactions between local and state actors and institutional structures.

Chipofya, M.; Karamesouti, M., Jan, S., Schwering, A., Murcia, C., Schultz, C., Ho, S., Osewe, G., Chika, B. (2018). Modelling Local Knowledge for Inclusive and Responsive Land Information Systems: The Southern Kenyan Maasai Ontology. Proceedings of 19th Annual World Bank Conference on Land and Poverty, March 19 – 23, Washington, DC, USA.

Abstract: This paper presents a formal domain model for land-related concepts in Maasai communities in Kajiado County in Southern Kenya. The goal of the domain model, termed the Southern Kenyan Maasai Ontology (SKMO), is to contribute to closing the gap between the formal and indigenous or local conceptualizations of land tenure. SKMO

supports a bottom-up approach to recording land tenure information that emphasizes local needs. SKMO is part of an innovative land tenure recording tool called "Smart Sketch Maps" that integrates information from hand drawn sketch maps into an underlying topographic base map. In this work we discuss the approach used in developing the SKMO domain model and provide empirical justifications for it.

Koeva, M., Bennett, R., Gerke, M., Crommelinck, S., Stöcker, C., Crompvoets, J., Ho, S., Schwering, A., Chipofya, M., Schultz, C., Zein, T., Biraro, M., Alemie, B., Wayumba, R. and Kundert, K. (2017). Towards innovative geospatial tools for fit-for-purpose land rights mapping. Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-2/W7, 37-43, https://doi.org/10.5194/isprs-archives-XLII-2-W7-37-2017, 2017.

Abstract: In large parts of sub Saharan Africa it remains an ongoing challenging to map millions of unrecognized land rights. Existing approaches for recognizing these rights have proven inappropriate in many cases. A new generation of tools needs to be developed to support faster, cheaper, easier, and more responsible land rights mapping. This is the main goal of its4land, a European Commission Horizon 2020 project that aims to develop innovative tools inspired by the continuum of land rights, fit-for-purpose land administration, and cadastral intelligence. its4land is using strategic collaboration between the EU and East Africa to deliver innovative, scalable, and transferrable ICT solutions. The innovation process incorporates a broad range of stakeholders and emergent geospatial technologies, including smart sketchmaps, UAVs, automated feature extraction, as well as geocloud services. The aim is to combine innovative technologies, capture the specific needs, market opportunities and readiness of end-users in the domain of land tenure information recording in Eastern Africa. The project consists of a four year work plan, €3.9M funding, and eight consortium partners collaborating with stakeholders from six case study locations in Ethiopia, Kenya, and Rwanda. The major tasks include tool development, prototyping, and demonstration for local, national, regional, and international interest groups. The case locations cover different land uses such as: urban, peri-urban, rural smallholder, and (former) pastoralist. This paper describes the project's activities within the first 18 months and covers barriers discovered, lessons learned and results achieved.

Buntinx, I., Ho, S., Broucker, B. and Crompvoets, J. (2017). Implementing innovative land tenure tools in East Africa: SWOT analysis of land governance. 2017 FIG Working Week, 29 May – 2 June, Helsinki, Finland.

Abstract: In developing countries, formal land administration systems and related land tenure processes are not able to keep up with the pace of development. Within this context, the its4land project aims to address the challenge of improving the formal recordation of land tenure information by producing a fit-for-purpose suite of innovative geospatial tools that can be adopted by stakeholders in Ethiopia, Rwanda and Kenya. To ensure that these technologies can be adopted and sustained, it is crucial to examine how these innovative geospatial tools need to be governed. As a first step, this paper explores the current land governance context to identify potential implications for implementation. Specifically, the three different case countries are analysed based on five different land governance factors, namely socio-economic country context, the types of tenure that exist, the operation of current land market, land reforms and organisations that

are responsible for administering and regulating land tenure. Based on these factors, the preliminary SWOT analysis identified preliminary insight into how current land governance conditions may or may not be conducive to the introduction and implementation of the geospatial tools.

Amsing, C., Bennett, R., Ho, S. and Zevenbergen, J. (2017). Assessing technological possibility against societal need: smart sketchmaps for fit-for-purpose land administration. 2017 FIG Working Week, 29 May – 2 June, Helsinki, Finland.

Abstract: This paper explores the potential of smart sketchmaps for delivering fit-for-purpose land administration in Eastern Africa. It does this by assessing whether smart sketchmaps include the fit-for-purpose land administration elements according to different stakeholder perceptions. Whilst the use of sketch mapping itself is not new in land administration, smart sketchmaps' technologies and processes allow for conversion of hand drawn sketch maps into topologically and spatially corrected maps. Smart sketchmaps can provide qualitative spatial information in areas where conventional cartographic and geospatial knowledge is often limited. Including these maps in the land administration system not only adds to existing data about visible boundaries, but importantly introduces records of those less obvious socially or temporally constructed de facto boundaries that are significant in customary tenures.

Bennett, R., Gerke, M., Crompvoets, J., Ho, S., Schwering, A., Chipofya, M., Schultz, C., Zein, T., Biraro, M., Alemie, B., Wayumba, R., Kundert, K., Crommelinck, S. and Stocker, C. (2017). Building third generation land tools: its4land, smart sketchmaps, UAVs, automatic feature extraction, and the geocloud. Proceedings of the 18th Annual World Bank Conference on Land and Poverty, 20-24 March, Washington, DC, USA.

Abstract: A third generation of land tools is emerging: 'its4land' is part of the movement. The initiative aims to create seven new tools that further support faster, cheaper, easier, and more responsible land rights mapping. The tools are inspired by the continuum of land rights, fit-for-purpose land administration, and cadastral intelligence. The project is built around an ICT innovation process that incorporates a broad range of stakeholder groups with emergent geospatial technologies, including smart sketchmaps, UAVs, automated feature extraction, and geocloud services. By coupling the technologies, end-user needs and market forces, are better responded to. Backed by the European Commission, the work consists of a 4 year work plan, €3.9M in funding, and 8 consortium partners. The project is working with stakeholders from six case study locations in Ethiopia, Kenya, and Rwanda: tool development, prototyping, and demonstration is intended for local, national, regional, and international interest groups. The case locations include a mix of livelihoods and landscapes: urban, peri-urban, rural smallholder, and (former) pastoralist contexts are all included. This paper reports holistically on the first year of its4land activities: lessons from major achievements and barriers are outlined. Risks and future opportunities are also explored.

Buntinx, I., Broucker, B., Pattyn, V., Ho, S. and Crompvoets, J. (2016). Geospatial technology innovations for land tenure security in East Africa. GSDI15 World Conference, 29 Nov – 2 Dec, Taipei, Taiwan.

Abstract: Sub-Saharan Africa has an immense challenge to rapidly and cheaply map millions of unrecognized land rights in the region. To cope with these challenges a research project called 'its4land' aims to develop an innovative suite of land tenure recording tools for three East African countries. For each country, a refined audit of necessary stakeholders to engage with will be conducted. The identified categories are used for designing the subsequent data collection instruments, whilst the actors identified become participants in the data collection activities. Thereafter, a multi-stakeholder and multi-sectorial analysis is applied and the diverse nature of the actors, their interests and potential impact on the project will be taken into account. Since the use case areas provides a few vignettes of common land tenure challenges across Sub-Saharan Africa, it can provide a wealth of lessons to other contexts in Sub-Saharan Africa, and perhaps beyond. Moreover, it can provide insights into the current status of land tenure recording and ICT capacity in the three target countries.

Under review

Koeva, M., Crommelinck, S., Stöcker, C., Crompvoets, J., Ho, S. Buntinx, I., Schwering, A., Chipofya, M., Sahib, J., Zein, T., Timm, C., Kundert, K., Nkerabigwi, P., Alemie, B. and Wayumba, R. (2018). 'its4land' - challenges and opportunities in developing innovative geospatial tools for fit-for-purpose land rights mapping. Proceedings of the 2018 FIG Congress, 6-11 May, Istanbul, Turkey.

This paper reports recent achievements, findings and challenges faced during the first half of the its4land project. As a result, a multi-disciplinary approach to capture and share land tenure related land use information is shown. It discusses ongoing challenges and potential opportunities identified in the project.

Stöcker, C., Koeva, M. Ho, S., Bennett, R., Nkerabigwi, P. (2018). Towards UAV-based land tenure data acquisition in rwanda: needs assessment and technology response. Proceedings of the 2018 FIG Congress, 6-11 May, Istanbul, Turkey.

This paper uses a multidisciplinary approach to consider if the application of UAVs can meet contemporary land administration requirements in developing countries. It uses Rwanda as the case country, where the outcomes of a needs assessment, as well as a large number of UAV test flight missions in Germany, provide the pre-requisites for the design of UAV workflows in order to assure that development is in service of societal needs and not a consequence of the technical characteristics of the technology.

2.3 Industry reports

These reports to industry were prepared for the valorisation panels of each country. The reports were a summary of the research and analysis of WP2 activities and were provided to aid valorisation, dissemination and communication of its4land.

Ho, S. (2017). Ethiopia – Country Report for Work Package 2 'Get Needs'. Report to the its4land Ethiopian Valorisation Panel. Oct 2017, 61 pp.

Ho, S. (2017). Kenya – Country Report for Work Package 2 'Get Needs'. Report to the its4land Kenyan Valorisation Panel. Oct 2017, 60 pp.

Ho, S. (2017). Ethiopia – Country Report for Work Package 2 'Get Needs'. Report to the its4land Rwandan Valorisation Panel. Oct 2017, 49 pp.

2.4 Dissertation supervision

The research expertise associated with WP2 supports higher degree dissertations in topics directly or indirectly related to the its4land project.

Amsing, C. (2017). Assessing technological possibility against societal need: smart sketchmaps for fit-for-purpose land administration. Masters dissertation, Faculty of Geo-information Science and Earth Observation (ITC), University of Twente, Netherlands.

This thesis won in the category of 'GIS, Mapping and Cadastre' in the 2017 Council of European Geodetic Surveyors (CLGE) student contest recognising student work in survey-related areas.

Buntinx, I. (in progress). Modelling governance to support the use of innovative geospatial technologies for land tenure recording: case studies in East-Africa, Faculty of Social Sciences (Public Governance Institute), KU Leuven.

This thesis is associated with Work Package 7 in the project.

Odero, G. T. O. (in progress). Development of a methodology for the documentation of retained aspects of customary land tenure rights in Kenya. Doctoral dissertation, School of Surveying and Geospatial Sciences, Technical University of Kenya.

Chika, B. A. (in progress). Development of a digital cadastral model to support general boundary systems in Kenya. Doctoral dissertation, School of Surveying and Geospatial Sciences, Technical University of Kenya.