



# Deliverable 2.3

## Research instruments

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**Abstract:**

A description of the frameworks, theories, research methodologies and methods for WP2 'Get Needs'

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## Executive Summary

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This is the third deliverable report (D2.3) under the project ‘its4land’, Work Package 2 (WP2), which aims to capture stakeholders’ needs, readiness, and the market opportunities regarding the application of the four geospatial innovative technologies, namely sketchmaps, Unmanned Airborne Vehicles (UAVs), automated feature extraction and geocloud services. These technologies are intended to facilitate land tenure information recording activities in the three East African countries of Ethiopia, Rwanda and Kenya.

D2.3 describes the research instruments (frameworks/theories, methodologies, methods) proposed for WP2. These include Actor Network Theory, Multi-actor Multi-criteria Analysis and Change Theory. Although a case study approach is generally applied, an integrated research design is proposed to facilitate a mixed-methods data collection and analysis methodology as directed by the adoption of a critical realist paradigm. The report provides only a brief description of the expected research methods (a draft questionnaire is provided as an appendix).

The report concludes by providing a brief overview as to how these research instruments can be applied across the proposed case study locations, as well as necessary conditions and prerequisites. An outline of research task allocations among partners and the timeline for these to be executed across the duration of the project is also provided.

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# 1. Introduction and objectives

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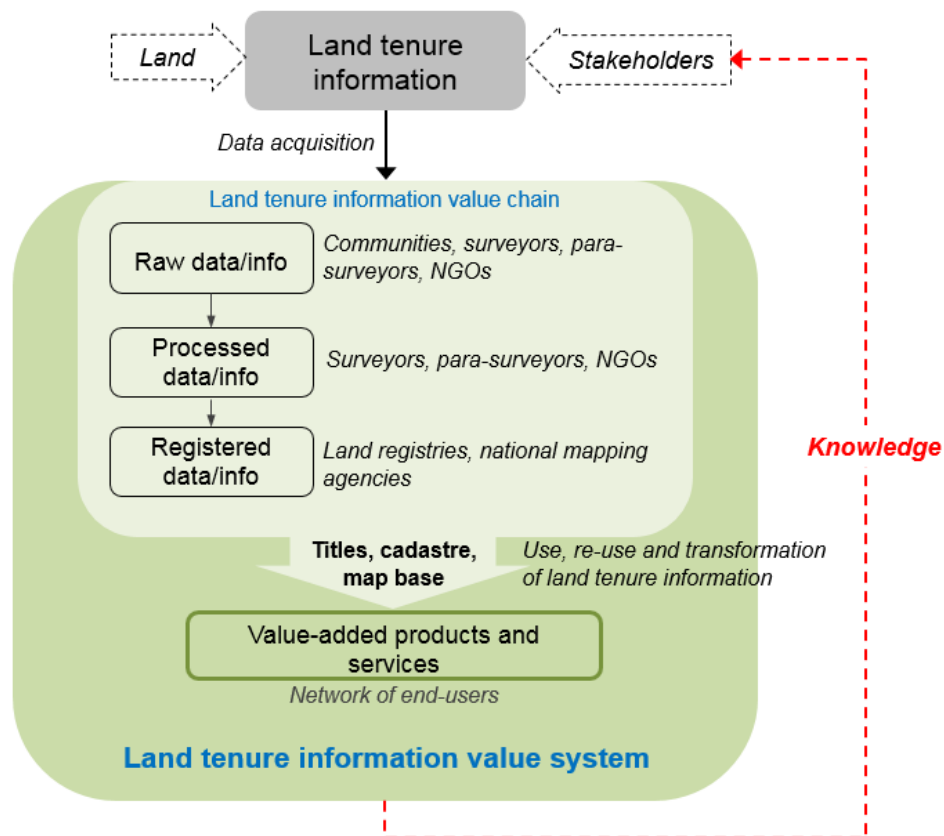
its4land is a European Commission Horizon 2020 project funded under its Industrial Leadership program, specifically the ‘Leadership in enabling and industrial technologies – Information and Communication Technologies ICT (H2020-EU.2.1.1.)’, under the call H2020-ICT-2015 – and the specific topic – ‘International 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 inexpensively map millions of unrecognised and/or unrecorded land rights in the region and register them in formal land administration systems. ICT innovation is intended to play a key role. Many existing ICT-based approaches to land tenure recording in the region have not been successful: 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 capitalisation. 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 contextualisation, design, and eventual land sector transformation. In line with Living Labs thinking, localised 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 is directly linked to ‘Work Package 2 (WP2) – ‘Get Needs’ of the its4land project. WP2 aims to **capture stakeholders’ needs, readiness and market opportunities** regarding the application of the four geospatial innovative technologies: sketchmaps, Unmanned Airborne Vehicles (UAVs), automated feature extraction and geocloud services in order to support design activities in WPs 3-6 and modelling activities in WPs 7-8. These technologies are intended to facilitate land tenure recording purposes in the three East African countries of Ethiopia, Rwanda and Kenya. Ultimately, these geospatial innovations aim to augment the land tenure information value system in these countries.

The term ‘value system’ is used here to reflect the perspective that land tenure information maintains a value chain (as defined by Porter, 1985) up to the point of registration. Thereafter, a network of processes and activities within and between

organisations transforms land tenure information into value-add products for a broad range of end-users; together, this constitutes a value system (Rayport and Jaworski, 2001). The **land tenure information value system** is therefore constituted by those activities within and between stakeholders that produce inputs/outputs associated with the acquisition, management, access and re-use of land tenure information to deliver a valuable product or service to end-users. This is contextualised and illustrated in Figure 1.



**Figure 1.** Land tenure information value system.

Following on from the outcomes of Deliverable 2.2 (D2.2) presenting the stakeholder audit and classification, a range of research instruments are presented in this deliverable. **The term ‘research instruments’ refers to the variety of frameworks/theories, research methodologies and methods adopted for WP2 (e.g. questionnaires, etc.) although research methods (data collection instruments) are only generally described in this report due to a need to verify their appropriateness in the field first.**

The main aim of WP2 can be expressed as a series of four research questions:

- R1. What are stakeholders’ needs relevant to land tenure information recordation, and how do these affect other stakeholders’ needs along the land tenure information value system? This will address both
- R2. How might the proposed geospatial technologies meet stakeholders’ land tenure information recordation needs?

- R3. Where the proposed technologies can better support stakeholders' needs, how ready are stakeholders to adopt these new technologies?
- R4. What are the potential market opportunities associated with: 1) the introduction and adoption of these new technologies; and 2) more current and complete land tenure information?

For the purposes of consistency, the following definitions are adopted for WP2:

- **Stakeholders** are defined to be those who affect, or are affected by the land tenure information value system. In this project, primary stakeholders are defined to be those who have a direct role in acquiring, recording, managing and distributing land tenure information; secondary stakeholders are defined to be those who only re-use and/or add value to land tenure information to provide products and services.
- Stakeholders' **needs** are defined to be those practical information requirements and transaction processes necessary to support their individual/organisational aims relative to their place in the land tenure information value system.
- Stakeholders' **readiness** is defined to be their inclination towards sustainably adopting the four geospatial innovative technologies for the purposes of land tenure recordation. This infers social (cultural, organisational and regulatory) and technical abilities and capacity for innovation.
- **Market opportunities** are defined to be those products or services associated with adoption and use of those four geospatial technologies along the land tenure information value system but which are not currently available or provided. In addition, these opportunities aim to exploit a growing market of land tenure information and/or technology users, which is to be expected if innovation is successful.

To respond to the research questions, the following methodologies are proposed:

- Actor Network Theory (Latour, 2005; Law, 1992), to understand and map the current state and interactions of stakeholders and technologies in the land tenure information value system. This will address both R1 and R2.
- Multi-Actor Multi-Criteria Approach – MAMCA (Macharis, 2005; Macharis, Turcksin, & Lebeau, 2012), to understand and assess the potential viability of the different technologies respective to needs. This will address both R1 and R2.
- To assess stakeholder readiness, we will develop a **Readiness Assessment** tool that leverages the outcomes of the MAMCA analysis, as well as input from work packages 3, 4, 5 and 6. This tool will be underpinned by Change Theory (Beckhard and Harris, 1987) and will address R3 and provide the basis for R4.
- To identify market opportunities, outcomes from previous methods will be used undertake in-depth interviews with the public sector and commercial stakeholders. This method will address R4.



Data collection methods are expected to be semi-structured interviews, either individually or via focus group discussions. This will be supplemented by mechanical/technical observations from other work packages in its4land.

Deliverable 2.3 (D2.3) is intended to be a living document through the project and is structured into six sections beginning with this introductory section. Section 2 briefly introduces the methodologies; section 3 presents the integrated research design. The ways in which different data collection instruments are applied in the different countries (including their case areas as presented in D2.2) and towards the four technologies are explained in Section 4. The final sections 5 and 6, respectively present the task allocations per partner and the timing of relevant data collection activities.

## 2. Research frameworks and theories

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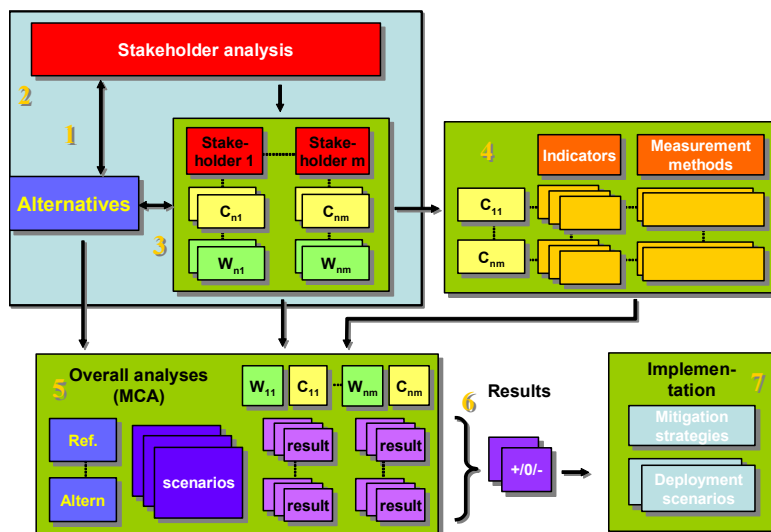
This section outlines the proposed frameworks/theoretical lenses through which the aims of WP2 will be pursued. It first provides an overview of the relevant framework/theory before describing how this relates to discovery of stakeholders' needs, readiness and market opportunities. Appendix 1 provides a draft version of an integrated questionnaire intended to guide interview activities as a foundation for the discovery of stakeholders' needs, readiness and market opportunities.

### 2.1 User needs assessment

The objective of applying Multi-Actor Multi-Criteria Analysis (MAMCA) is to identify the needs of different stakeholders relevant to land tenure information recording technologies. As indicated in section 1, stakeholders' needs are defined to be those practical information requirements and transaction processes necessary to support their individual/organisational aims relative to their place in the cadastral information value chain.

MAMCA is an extension of the existing Multi-Criteria Analysis (MCA) (Laarabi et al, 1996). The MAMCA methodology allows researchers to evaluate different alternatives (policy measures, scenarios, technologies, etc.) with regard to the objectives of the different stakeholder groups that are involved in the decision making process. This methodology is particularly useful as it explicitly includes the stakeholders and uncovers their points of view. The methodology was developed by Macharis (2005) and has been used in many projects with different contexts, such as transport decision making (Macharis et al., 2009) as well as the evaluation of different scenarios for implementing spatial data infrastructures (Macharis and Cromptvoets, 2014). The MAMCA consists of two phases (Macharis et al., 2009). The first phase is mainly analytical and includes the gathering of all the necessary information. The second phase is the synthetic or exploitation phase and consists of the actual analysis.

These two phases are divided respectively into four and three steps, as can be seen in Figure 2. The first step comprises of the problem definition and the determination of the possible alternatives for further development. In the second step, a selection of relevant stakeholders will be made, and their objectives will be highlighted. These objectives are then translated into evaluation criteria (step 3), which need to be weighted. In the fourth step, one or more measurable indicators are linked to each criterion. They allow the evaluation of each alternative with regards to a given criterion and are either quantitative or qualitative, depending on the criterion. The fifth step aggregates all the information from the previous steps into an evaluation matrix. The actual results are given in step six and are generated through multi-criteria analysis. This permits the analysis of the advantages and disadvantages of every alternative. The seventh and final step is the actual implementation of the results.



**Figure 2.** The MAMCA methodology (Source: Macharis et al., 2005).

### 2.1.1 Application to project domain

Prior to the execution of MAMCA, relevant stakeholder groups who have a role in land tenure information recording will be identified. In Deliverable 2.2, the following main stakeholder groups were defined: Public Sector entities, Non-statutory entities, Private Sector entities, NGOs/Not-for-Profit/Donors/Development partners, and Research & Development entities. From the defined list provided in D2.2, a set of relevant stakeholders and representatives will be determined, likely by experts.

However, following the MAMCA method, the stakeholders will be further categorised into groups who share a common set of objectives pertaining to land tenure information recording. A workshop will be organised in the respective countries to collect data. Some examples of the semi-structured workshop questions are provided below.

**Table 1.** Potential questions used in MAMCA data collection.

MAMCA Steps		Potential structured questions for workshop
1.	Determination of possible alternatives associated with its4land technologies that responds to organisational aims of stakeholder groups  (also used as input into readiness assessment)	1. What is your role(s) in land tenure information recording (i.e. organisational and/or community objectives)? 2. How is information currently collected and curated? 3. What are current data challenges? 4. What are current process challenges? 5. What are current organisational and/or institutional challenges (micro and macro)? 6. How might the its4land technologies enable your tasks (i.e. respond to challenges) related to land tenure information?
2-3	Translating objectives into criteria	7. What are key criteria that reflect the achievement of identified objectives in step 1? 8. Define the importance of these criteria using values

MAMCA Steps		Potential structured questions for workshop
		between 0 and 1 (i.e. assign weights)*. <i>*This is executed as a pair-wise comparison between the different criteria. The outcome is a ranking.</i>
4	Define indicators	9. What are measurable indicators related to each criteria previously identified? Define measurement unit (either qualitative or quantitative).
5	Evaluate the technologies  (also used as input into readiness assessment)	10. How might the its4land technologies fare* in meeting the alternative scenarios? identified objectives/criteria using these indicators?  <i>*This is executed as a pair-wise comparison using the identified objectives, criteria and indicators for each scenario. The outcome is a ranking of the technologies per scenario.</i>

The final step, step 6, involves calculating the results of each alternative and each stakeholder group. They are generated through multi-criteria analysis using the weights of the criteria obtained in step 2 and the pairwise comparisons of step 5 to indicate the strengths and weaknesses of each alternative for each stakeholder group. At this stage, a sensitivity analysis, exploring the effects of a change of the weights on the ranking, can be performed.

## 2.2 Readiness assessment

This component of WP2 is focused on change. In a well-established model of change by Beckhard and Harris (1987), change is defined as a transition from the current state, to the future state. A prelude to successful change however, is readiness to implement change on the part of stakeholders (Oakland & Tanner, 2007). Readiness is recognised to be both multi-level and multi-dimensional – across the significant body of organisational change literature, readiness assessment is often performed at both the individual and organisational level attending to both psychological aspects (e.g. belief in change, recognising need for change, support for change, etc.) and structural aspects (e.g. resources, technologies, processes, etc.) (Rusly, Corner, & Sun, 2012; Weiner, 2009). As posited in the introduction, and reflecting common elements across organisational change literature, our working definition of readiness involves both social (cultural, organisational and regulatory) as well as technical abilities and capacity for the adoption of innovative land information recordation tools.

Therefore there are two main components to our undertaking of an assessment of stakeholders' readiness. Firstly, a definition of current and future states (incorporating the use of new geospatial technologies) for each case location pertaining to land tenure information recordation needs to be determined; secondly, the development and conduct of a readiness assessment tool.

### 2.2.1 Defining current and future states

#### *Establishing the current state*

One of the main activities identified to establish the current state is to identify the network of actors that have a stake in land recordation in each particular case area. The concept of a network reflects the dynamic and heterogeneous interactions between a large number of parties (Vancauwenberghe et al., 2011). A land information recordation

network captures the organisations that are involved in land recordation, or that will be involved (and which have expressed a need – see previous paragraph 2.2) in the implementation of one of the geospatial tools. In addition, it captures the flows and nature of the interaction that exist between these stakeholders.

WP2 will adopt Actor-Network Theory (ANT) (Latour, 2005; Law, 1992) to conceptualise and analyse the current state as this seeks to understand material (between organisations/stakeholders) and semiotic (conceptual) relationships among a community(s) of practice (Elder-Vass, 2008). This will be particularly relevant for understanding and relating different concepts of tenure, as well as understanding how the land tenure information system and well as the political economy of each case study country is constituted (e.g. will apply a broad lens and consider the stakeholders involved in the production, management, exchange and the use of the land recordation tools and the information generated by these). In general, ANT has been found to be valuable in the study of sociotechnical systems as it focuses on both human and non-human actors typical in information systems (e.g. Walsham, 1997); it has also contributed to developing understanding of technological change in developing countries (Heeks & Stanforth, 2015).

### 2.2.2 Application to project domain

Data for applying ANT will likely be collected through interviews, surveys, observations and documentary analysis. A network analysis can then be performed, which will also provide a visual and descriptive characterisation of the current land tenure information value systems. This network analysis is likely to be undertaken as a participatory activity during interviews guided by a semi-structured schedule of questions,, such as those indicated in Table 2.

**Table 2.** Potential questions used in ANT data collection.

Research objective	Potential questions	Mapping activity
Identifying source of legitimacy	<ol style="list-style-type: none"> <li>1. What are your responsibilities regarding land tenure information recordation?</li> <li>2. How is your role in land tenure information recordation recognised by 1) other organisations and/or 2) the community?</li> </ol>	<i>NA -Backgrounding</i>
Problematisation	<ol style="list-style-type: none"> <li>3. What are the specific challenges you experience in land tenure information recordation related to (state identified case problem here)?</li> </ol>	<i>NA -Backgrounding</i>
Enumerating stakeholders in the land tenure information value chain	<ol style="list-style-type: none"> <li>4. Which other land actors do you interact with in fulfilling your responsibilities? Who do you consider to be a) primary stakeholders and b) secondary stakeholders?</li> <li>5. Is this a one-way or two-way interaction?</li> <li>6. How frequently do you interact with them (e.g. daily (5 lines), weekly (4 lines), monthly (3 lines), every few months (2 lines), a few times a year (1 line)).</li> </ol>	<p>Drawing other stakeholders – size of circle indicates relative importance.</p> <p>Mapping position of primary and secondary stakeholders.</p> <p>Drawing arrowed lines</p>

Research objective	Potential questions	Mapping activity
		between stakeholders (no. of lines indicate frequency).
Identifying potential stakeholder-technology relationships	<p>7. Where might its4land technology(s) be introduced into relationships and/or processes?</p> <p><i>UAV = UAV</i>  <i>SSM = smart sketchmaps</i>  <i>AFE = rule-making (sets the rules)</i>  <i>GC = geocloud services</i></p>	Identifying potential position of its4land technology in actor network.
Defining importance of stakeholders	<p>8. Why are these stakeholders important to the issue being discussed?</p> <p>9. Why are these stakeholders important to the adoption of the its4land technology(s)?</p> <p><i>V = veto</i>  <i>RM = rule-making (sets the rules)</i>  <i>R = has resources (knowledge, people, money, etc.) that affects the issue</i>  <i>N = is well-connected</i></p>	Indicate importance if stakeholder using letters V, RM, R and N.

This participatory mapping exercise is likely to produce two actor-network mappings:

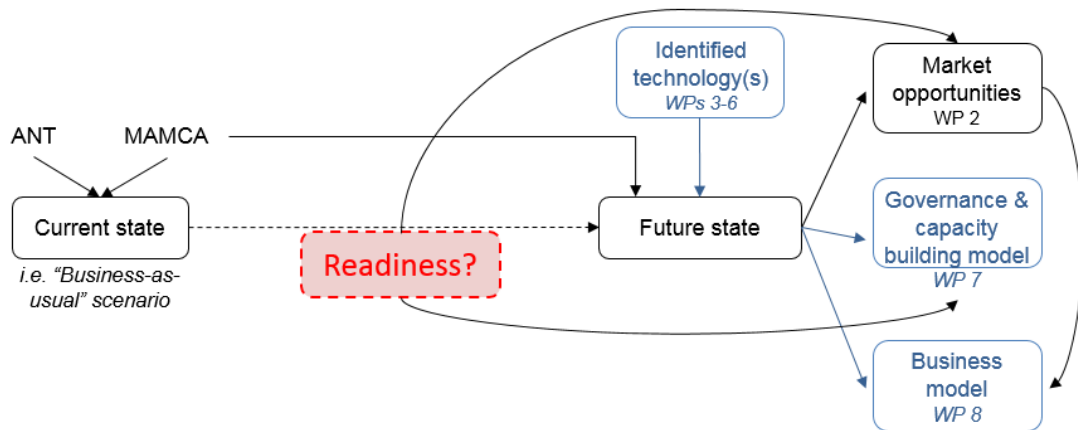
1. Mapping outcome 1: actor-network related to land tenure recordation issue.
2. Mapping outcome 2: actor-network related to potential use and adoption of its4land technology.

These analyses will identify transaction flows between parts of the value system, make explicit organisational dependencies and highlight significant sections of the value system (e.g. in transforming land tenure information to other types of products and services. In addition to ANT, we anticipate that the research activities associated with MAMCA (see previous section) will provide validation and corroboration of the determination of the current state. A definition of the current state will also essentially provide a baseline scenario (or a “business-as-usual” change scenario) for the readiness assessment.

#### *Establishing the future state*

The definition of a future state will be an informed hypothesis. **Primarily, this will be predicated on outputs from other WPs in the its4land project, namely: WPs 3 (draw and make), 4 (fly and create), 5 (automate it) and 6 (publish and share) since these will determine those technologies most appropriate for use in each of the case locations.** Further input from stakeholders will support the proposition of characteristics of the ideal institutional (socioeconomic), regulatory and structural environments for supporting the use of the identified technology(s).

This, together with outputs from MAMCA, will support WP2’s ability to define a ‘future state’ that stakeholders will be assessed against. This future state will also provide the basis of investigation for market opportunities (see section 2.3) in WP2, as well as WP7 (governance and capacity building) and WP8 (business modelling). This is illustrated in Figure 4 (where the blue boxes indicate relationships with other WPs).



**Figure 3.** Relationship between WP2 and other WPs pertaining to readiness assessment.

### 2.2.3 Developing a readiness assessment tool

In contrast to e.g. the e-government or ICT literature, where a plurality of readiness assessment tools circulates (see Alaaraj and Ibrahim (2014) for a review of readiness assessment tools in e-government), no such measurement instrument is – to our knowledge – readily available for the adoption of land information recordation tools in developing countries. Part of WP2 will hence consist of the development of a suitable measurement tool for a comprehensive assessment of adoption readiness of geospatial land information recordation tools. To do this, the following activities will be undertaken; although analytically distinguished, most activities will run in parallel.

#### *Literature review of readiness definitions and readiness assessment tools*

We will map available conceptualisations of readiness and corresponding assessment tools with particular attention to the indicators that different scholars/organisations have put forward as important to consider. In the absence of an explicit framework for measuring innovation readiness in land administration (particularly for information recordation tools), we will draw inspiration from literature in e-government and ICT, and consider criteria in well-known IT governance and management frameworks that also assume a holistic approach, such as Control Objectives for Information and related Technology (COBIT) (ISACA, 2016).

#### *Refined conceptualisation of readiness and list of readiness indicators*

Based on the literature review, the readiness working definition will be fine-tuned and a list of relevant indicators will be developed that together, aims to provide a valid characterisation of stakeholders' readiness for innovation in the context of its4land.

We expect to group indicators along different dimensions, of which the following are currently taken into consideration as they are either present in most readiness assessment frameworks (Alaaraj and Fatimah, 2014), or in reviews of challenges to ICT and e-government in developing countries (e.g. Gil-Garcia and Pardo, 2005; Lainhart, 2000):

1. Stakeholders' competencies, skills and attitudes
2. Information and data
3. Infrastructure and technology

4. Legal and regulatory framework
5. Institutional (socioeconomic) framework.

From the tentative list of dimensions, it appears that the readiness assessment will likely concern dimensions (and indicators) that relate to different aspects of the actor network, and will be both multi-dimensional and multi-level: some will concern the level of individual actors, whereas others will concern the attributes of the network in general or the chain of interactions. The different dimensions are strongly related to each other.

*Quantitative and qualitative readiness assessment in cases areas*

For each of the above readiness dimensions, and the associated indicators, a quantitative score index will be subsequently developed to systematically measure the extent to which stakeholders are ready to adopt innovative land recordation tools. Having an index enables us to compare case areas within and across countries and the quantitative scores will be complemented with qualitative narrative information that supports the interpretation of indices. Finally, an overall readiness assessment will be developed by combining the scores of the different dimensions. The final output of the readiness assessment is likely to resemble the following table.

**Table 3.** Readiness assessment measurement tool.

READINESS DIMENSIONS	INDICATORS	SCORE PER INDICATOR	SCORE PER DIMENSION	QUALIFICATION & INTERPRETATION
1. Stakeholders' competencies, skills and attitudes	- Indicator a - Indicator b ...	- Score indicator a - Score indicator b ...	Readiness assessment dimension 1	Readiness index ++/+/+/-/--
2. Information and data	- Indicator c - Indicator d ...	- Score indicator c - Score indicator d ...	Readiness assessment dimension 2	Readiness index ++/+/+/-/--
3. Infrastructure and technology	- Indicator e - Indicator f ...	- Score indicator e - Score indicator f ...	Readiness assessment dimension 3	Readiness index ++/+/+/-/--
4. Legal and regulatory framework	- Indicator g - Indicator h ...	- Score indicator g - Score indicator h ...	Readiness assessment dimension 4	Readiness index ++/+/+/-/--
5. Institutional framework	- Indicator i - Indicator j ...	- Score indicator i - Score indicator j ...	Readiness assessment dimension 5	Readiness index ++/+/+/-/--

### 2.2.4 Application to project domain

In the table below, we provide potential questions aimed at collecting information about stakeholders' readiness pertaining to UAV adoption for land tenure information recordation as an example of how this might be applied to the project domain. Similar questions will be developed for the other technologies where relevant for the respective case study locations.

It is likely that these questions will be tested in countries and revised. Indicators are likely to be inductively derived out of interview data. Similar questionnaires will be



developed for the other its4land technologies and common questions may be aggregated during data collection.

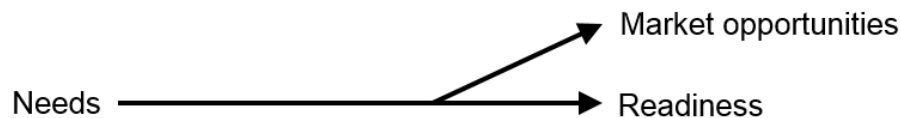
**Table 4.** Potential questions used for data collection around stakeholders' readiness (UAV).

Research objective	Potential questions
Stakeholders' competencies, skills and attitudes	<p><i>Attitudes:</i></p> <ol style="list-style-type: none"> <li>1. What is the community's perception of UAV technology in the context of supporting land tenure information recordation?</li> <li>2. Is there support for the use of UAV technology among the community?               <ul style="list-style-type: none"> <li>- If yes, at what level(s), and what evidence can be seen?</li> <li>- If no, what appears to be the main obstacles?</li> </ul> </li> <li>3. Is there support for the use of UAV technology among government organisations?               <ul style="list-style-type: none"> <li>- If yes, at what level(s), and what evidence can be seen?</li> <li>- If no, what appears to be the main obstacles?</li> </ul> </li> <li>4. Is there support for the use of UAV technology among private and/or non-profit organisations?               <ul style="list-style-type: none"> <li>- If yes, at what level(s), and what evidence can be seen?</li> <li>- If no, what appears to be the main obstacles?</li> </ul> </li> <li>5. Based on the UAV video, do participants feel that the UAV will improve their ability to fulfil their job requirements?</li> <li>6. Based on the UAV video, do participant feel that they will be able to be trained to use UAVs proficiently?</li> <li>7. What kind of organisational and/or political support is evident (non-verbal) regarding the use of UAV technology in land tenure information collection?</li> <li>8. What kind of organisational and/or political support is evident (verbal) regarding the use of UAV technology in land tenure information collection?</li> </ol> <p><i>Competencies and skills:</i></p> <ol style="list-style-type: none"> <li>9. Are there local employees and/or community members willing to be trained (and remain) as UAV pilots?</li> <li>10. Are there local employees and/or community members willing to be trained (and remain) in image processing?</li> <li>11. What is the level of computer literacy within the organisation?</li> <li>12. Is there the potential for developing ongoing localised training in UAV equipment (including maintenance) and data processing?</li> <li>13. How might the organisation work with the UAV company over the short to medium term?</li> <li>14. Is the environment appropriate for UAV training (e.g. flight planning in difficult terrain environments)?</li> </ol>
Information and data	<ol style="list-style-type: none"> <li>15. Are there existing orthoimages that can be used as georeferenced base maps?</li> <li>16. What level of detail (ground resolution) is needed?</li> <li>17. What LOD is acceptable for publishing (e.g. in terms of privacy)?</li> <li>18. How might flight planning be incorporated into the data acquisition workflow?</li> <li>19. Can the organisation accommodate (or is willing to accommodate) UAV data into its current registries and/or maps?</li> </ol>
Infrastructure and technology	<ol style="list-style-type: none"> <li>20. Does the organisation have a UAV, or are they willing to purchase one? (included in this are ground base station)</li> <li>21. Does the organisation have the required hardware to process UAV</li> </ol>

Research objective	Potential questions
	<p>images (laptop/PC of sufficient processing power)?</p> <p>22. Does the organisation have the right image processing software?</p> <p>23. Does the organisation have the right equipment to use UAV data in the field for community-based adjudication and/or boundary definition?</p>
Legal and regulatory framework	<p>24. What are the constraints/opportunities pertaining to the use of UAVs in the current legal and regulatory framework?</p> <p>- e.g. is it possible to fly within line-of-sight? Beyond line of sight?</p> <p>25. What are the data prescriptions regarding land tenure information in the current legal and regulatory framework and how does this relate to UAV data?</p>
Institutional (socioeconomic framework)	<p>26. Does the organisation have the means to mobilise and maintain [the UAV (appropriate vehicle, charging station, etc.)]?</p> <p>27. Is there political support between land-related ministries and civil aviation authorities to deploy UAVs?</p> <p>28. Are there potential vocational training organisations that can provide training and support to government organisations in using UAVs?</p>

## 2.3 Identifying market opportunities

WP2 needs, among other objectives, to identify the market opportunities, which in this context are identified as gaps in product and service provision in the land tenure sector, and relate to specific land tenure recording issues in Eastern Africa. In general, we conceptualise the inquiry into stakeholder needs and readiness as a continuum (i.e. overlap in research needs and many links and overlaps between research inputs and outputs), where at some point, the research diverges to support investigation into market opportunities. This is shown in Figure 5.



**Figure 4.** Conceptualisation of research progression to understand research aims of WP2.

As indicated in the preceding section, the definition of a future state provides the basis for identifying market opportunities. This, together with the analysis of outputs from previous questionnaires, the network analysis, MAMCA and the readiness assessment, will be analysed respective to current market conditions to provide initial recommendations around potential market opportunities. This will provide the foundation for in-depth interviews with public and private sector stakeholders to provide a more mature prediction of potential market opportunities that address gaps in capacity development and new service provision. This will provide input for WP 8 (business modelling).

### 2.3.1 Application to project domain

Some of the guiding questions during data collection might be:

- Is there a consistent short-to-medium term unmet or underserved need(s) for the its4land products (improved land tenure information) and/or related services (improved data collection, processing and dissemination)?
- Who might constitute the potential market segment (e.g. describing geography, industries, organisational size, revenue, etc.)?
- What is the potential value of the proposed product and/or service?
- Who might supply the product and/or service and are they able to do this sustainably? Does the market opportunity fit with the organisation?
- Who might be potential buyers?
- What are the potential obstacles to responding to market opportunity(s) e.g. preconditions to delivering product and/or service, product/service development requirements, government regulation, etc.?

To note, one of the main challenges in this part of WP2 is expected to be reconciling the public good characteristic of land tenure information with government organisations' need for a sustainable revenue stream to support the use of the technologies. It may be that typical questions around market assessment such as profitability and growth rate may not be applicable.

In addition to stimulating responses, participants' may also be asked to rate these aspects qualitatively to provide a basis for comparing market opportunities between technologies and/or between case study locations within a country.

## 3. Research design and integration

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This section of D2.3 aims to describe the general research design for the case studies. It begins first by establishing the underlying philosophy of inquiry, which then provides the logical selection of research methods. This is then followed by a description of the research methodology and the research design integration.

### 3.1 Research philosophy

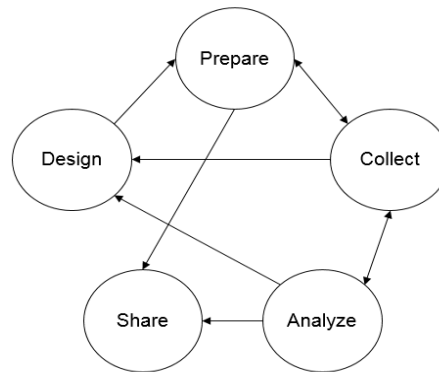
In response to longstanding criticisms about the dominance of positivist approaches (i.e. a tendency to focus only on externally observable and measurable phenomena) in research about technological innovation (e.g. Davis and Songer, 2002) and information systems (e.g. Orlikowski and Baroudi, 1991), this research adopts realism – specifically critical realism (Bhaskar, 1978) as an appropriate philosophy (Archer, Bhaskar, Collier, Lawson, & Norrie, 1998; Easton, 2009; Mingers, 2004).

The central tenet of critical realism is to (as much as possible) “get it right” about a phenomenon as it occurs in reality, paying attention to both physically observable and socially constructed aspects – therefore its characteristic methodology is mixed-methods (both qualitative and quantitative) and the use of triangulation across these multiple sources (Trochim, 2006) to support explanation, and ultimately enable prediction and control (Guba and Lincoln, 1994). Relevant to the aims of WP2, critical realism has emerged as a suitable framework for guiding examination of information in communities and/or organisations while being attendant to social and structural processes (Wikgren, 2005), as well as information systems (Zachariadis, Scott, & Barrett, 2010).

### 3.2 Research methodology

Research methodology generally refers to the processes involved in the research, mainly relevant to data collection and analysis. Critical realism is well-suited to a broad range of research methods depending on the objective of the research (Sayer, 2000). These are generally extensive e.g. larger scale quantitative based methods that are easily replicable and support the emergence of patterns/trends but with limited basis for developing causality), or intensive e.g. interviews or workshops that facilitate in-depth inquiry at the individual level that are not replicable but support the derivation of causal explanations through corroboration.

Therefore, the main research strategies employed in WP2 will be case studies and surveys, with the main units of analysis will be stakeholders and their relationships (in land tenure data production, management and use/re-use). Yin’s (2009) case study research process as a linear but iterative sequence of activities applies here (Figure 5) where data collection and analyses activities can also serve to refine the design and approach of the project as more knowledge is developed about the case studies. This supports the status of D2.3 (and indeed future deliverables as well) as a living document throughout the duration of the project.

**Figure 5.** Case study research process (adapted from Yin, 2009).

Single-site case studies are appropriate and valid under a critical realist paradigm as it enables the development of understanding of the complex factors and relationships in a phenomena; such case studies also entail an iterative-parallel research process (Easton, 2009; Verschuren, 2003). Therefore, as detailed in Deliverable 2.2, two local case studies within each of the nominated Sub Saharan African countries have been selected and justified. These case studies represent typical land tenure challenges in the East African region (and to some extent, across Africa), and will provide the basis of in-depth investigation to support explanation (about how new technologies can improve upon current challenges and meet needs and readiness) and prediction (regarding readiness and market opportunities).

### 3.2.2 Research methods

#### *Framework/theory-specific methods*

WP2 will collect both qualitative and quantitative data types. Some of the frameworks/theories overviewed in section 2 of this report are aligned with specific methods pertaining to data collection and analysis, e.g. network analysis is an analytical method under Actor-Network Theory. At this stage, we anticipate the data collection and analytical methods shown in Table 5 to be applicable; final methods will be decided pending discussion with experts in the domain in each country.

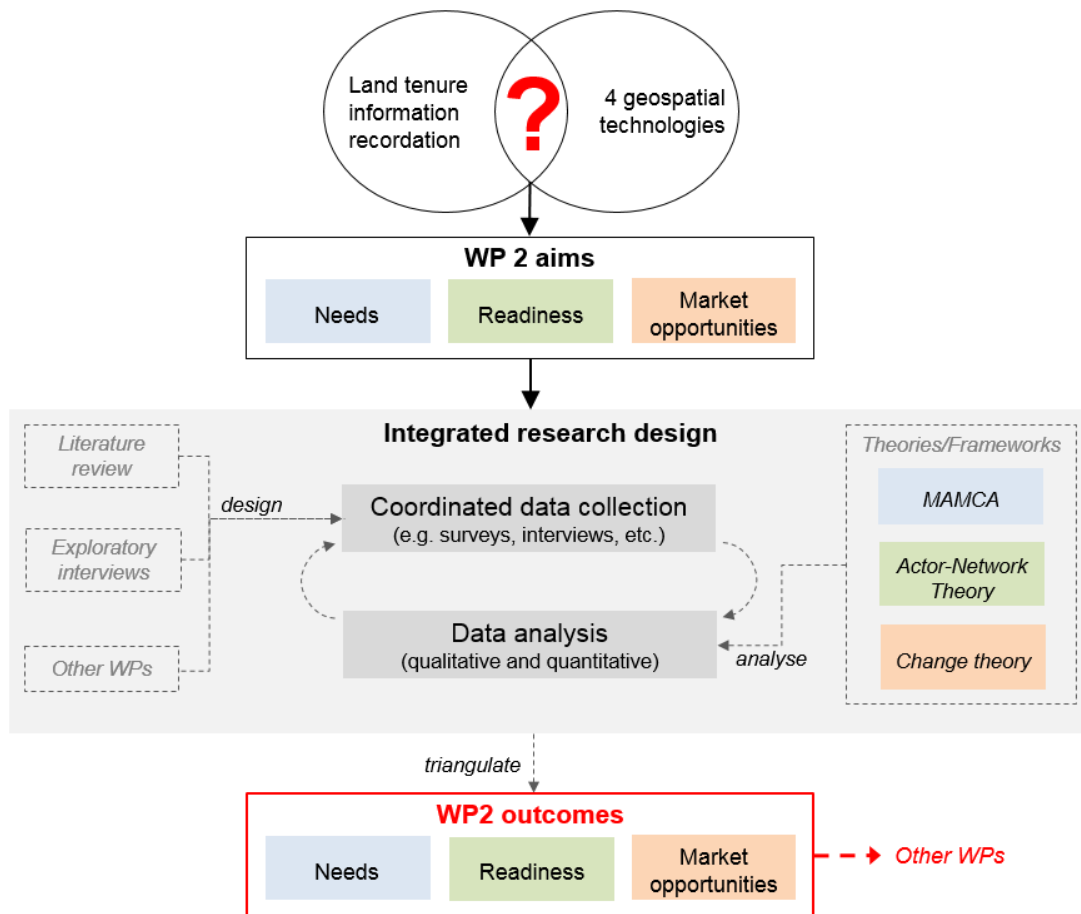
**Table 5.** Anticipated research methods for WP2.

	<b>Data collection</b>	<b>Data analysis</b>
Qualitative	literature review, workshops, group discussions, semi-structured interviews, documents and/or archival information, human observations	documentary analysis, descriptive analysis
Quantitative	surveys/questionnaires, criteria development, self-assessment tools, mechanical observations and experiment outcomes (from WP3-5)	network analysis, multi-criteria analysis

To the extent possible, interviews, surveys and group discussion sessions will be combined and coordinated in WP2. The basis of validity and reliability for these methods will be through corroboration by triangulation and peer evaluation (Lincoln and Guba, 1985; Denzin and Lincoln, 2011).

### 3.3 Research design integration

Under a mixed-methods approach, the various research frameworks and methodologies will be integrated (and partly applied in parallel and iteratively) to respond to the aim of WP2. As can be read in the former section, there is indeed some overlap; to avoid multiplication of questionnaires and to ensure a coordinated approach of data collection, an integrated design is pivotal. Figure 7 illustrates this integration.



**Figure 7.** Integrated research design for WP2.

As illustrated in Figure 4, research on stakeholders' needs and readiness are conceptualised as a continuum where outputs will then provide input into market opportunities analysis. Consequently, various inductive activities (e.g. literature review, exploratory interviews, etc.) will support the development of a coordinated data collection that will be tested in the field before deployment. Larger scale instruments such as surveys are expected to help build case area profiles and trends, while smaller

scale instruments such as interviews are expected to help develop in-depth understanding. The collected data will then be analysed according to the various frameworks/theories and due to the deductive nature of our approach, we expect several iterations between collection and analysis to support the elucidation of causal explanations or descriptions that best reflect reality around needs, readiness and market opportunities.

Table 6 below provides a summary of the various methodologies and data collection methods that will be employed in WP2.

**Table 6.** Summary of research methods and data collection instruments.

<b>Research focus</b>	<b>Methodologies</b>	<b>Data collection method</b>	<b>Expected outputs</b>
Stakeholder needs	Case study Survey network analysis MAMCA	Questionnaires EC Toolkit Interviews and workshops – guided Observations Expert opinions	Qualitative and quantitative characterisation of current state Problem definition Objectives Evaluation criteria, weights and indicators Needs (scenario) Definition and visualisation of network/system assessment Identification of 'desired state(s)'
Stakeholder readiness	Case study Survey network analysis Readiness assessment	Questionnaire EC Toolkit Interviews and workshops – guided Expert opinions	Readiness index Current state (network view)
Market opportunities	Case study Readiness assessment	EC Toolkit Interviews Expert opinions	Potential opportunities Success factors/ Recommendations

## 4. Application: areas and conditions

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The measurement of the needs, readiness and market opportunities will take place in the three different countries and the selected case study areas. As stated in D2.2, for all the three sub-Saharan African countries two specific case locations are selected. As indicated in D2.2, the choices are made prioritising a range of conditions including access and representation of typical challenges in the regions. The Ethiopian cases focus on peri-urban and rural land certification. Meanwhile, the Kenyan cases mainly address pastoralist land right registration in the context of subdividing group ranches into private holdings – and associated land disputes with other land uses. The Rwandese cases focus on urban and rural smallholders registration.

In section 3, the different research methods and data collection instruments were described. Here, the case study locations and their specificities are summarised. Next we provide an overview about the possibilities of application and how the different research methods can be applied.

### 4.1 Country overview

**Ethiopia.** Ethiopia is a country with a basic cadastre and land acquisition system. A complete and up-to-date cadastre is still missing (Bennett, 2013). The locations selected are the peri-urban region of Bahir Dar, and the rural region of Robit Bata.

Bahir Dar is one of the fastest growing cities in Ethiopia. Unlike more developed country contexts, the demarcation between rural and urban area in Ethiopia is not always sharply defined physically or administratively. In this context, these uncertain peri-urban areas can be described as institutional ‘vacuum’ zones. Because of this, land administration problems such as the high level of informality and land tenure insecurity appear to be enduring problems and present ongoing challenges for sustainable urban development (Adam, 2014). At the moment, the cadastre for Bahir Dar city is considered complete and fairly up-to-date. Orthophotos prepared for cadastral purposes – and shapefiles – are available. This is an important source of input for crosschecking the accuracy of UAV data created in its4land.

Robit Bata is a rural area, which is facing land degradation and fragmentation problems. In order to tackle these problems, land tenure information is vital as input information for land consolidation purposes. Also in this region, recent orthophotos are available to be used for land certification.

A contact database needs to be generated and continuously updated for the two case areas (Bahir Dar city and Robit Bata) by Bahir Dar University and an introductory workshop needs to be organised in which all relevant stakeholders are invited. The field data collection mainly includes surveys, in-depth interviews with key stakeholders and (area) experts, and/or focus group discussions. The field data collection activities need to be intensively managed under the supervision of KU Leuven. At the end, a finalization workshop needs to be organised in which the relevant stakeholders are invited to give feedback on research results. Key partners involved are KU Leuven and Bahir Dar University, but contribution of the other partners is also needed.



**Kenya.** The national cadastre in Kenya is largely incomplete and can be described as a patchwork of isolated and inconsistent cadastres (Siriba et al., 2011). The selected locations, Kisumu and Kajiado, have different problems regarding land administration.

The area around Kisumu town is characterised with a rapidly conversion from rural to urban area. The main problem here is that rural general boundaries cannot be maintained and secondly, the properties are increasing in value and are now in need of better boundary descriptions. Deploying conventional cameras to fly the area (to collect boundary information) from Nairobi is an obvious possibility but is considered an expensive affair. It is therefore proposed to make use of a UAV in order to demonstrate the efficiency of the new technology in mapping general boundaries within the peri-urban areas. In this context, it is good to be aware that according to the new Land Registration Act all registrable cadastral maps must have fixed boundaries.

In the region of Kajiado County nomadic pastoralism is still dominant. The land tenure system is dominated by group ranches without adequate survey control and without proper land use planning. In the process of subdividing and registering private land, pastoralists' migration routes and their needs to access important resources such as water points are often overlooked. In the meantime, pastoralists continue to practice open range grazing and moving from place to place in search of pastures and water, based on their traditional animal husbandry practices. As a consequence, the area is experiencing increased sub-division between nomadic pastoralism with communal grazing areas and immigration from other communities and investors in search for land for settlement, agriculture or tourism industry. Therefore, conflicts between pastoralists and crop farmers and pastoralism and the tourism industry are common in the area (Bennett, 2013).

A contact database needs to be generated and continuously updated for the two case areas (Kisumu and Kajiado) by the Technical University of Kenya and an introductory workshop needs to be organised in which all relevant stakeholders are invited. The field data collection mainly includes surveys, in-depth interviews with key stakeholders and (area) experts, and/or focus group discussions. The field data collection activities need to be intensively managed under the supervision of KU Leuven. At the end, a finalization workshop needs to be organised in which the relevant stakeholders are invited to give feedback on research results. Key partners involved are KU Leuven and the Technical University of Kenya, but contribution of the other partners – in particular University of Twente - are also needed.

**Rwanda.** Unlike Ethiopia and Kenya, Rwanda does not have a long land administration or national cadastre history. Nevertheless, the efforts of the past decade paid off. The results and prospects look very promising in terms of the implementation of a complete cadastre system. However, the current system is not yet adapted to upcoming sustainable development and land use challenges (Bennett, 2013). These problems will be investigated in Musanze City and Busogo, which is a rural area.

Musanze district is characterised by a high population density but the land use is predominantly rural with small parcel sizes. After the land tenure regulation program was completed in 2013, some sectors in this district became urbanised at a rapid pace. A large part of the agricultural land and forest are being transformed into built up area. The rural areas are made of small plots with very fertile soils because of the volcanoes

around them. Within this district, two specific case locations are chosen, namely Musanze City and Busogo. Musanze City is one of the largest cities of Rwanda.

Busogo sector is located approximately 10 kilometres west of Musanze City and is more rural. The rural areas are made of small plots with very fertile soils because of the volcanoes surrounding them but a large part of the agricultural land and forest are being transformed into built up areas. Both locations are located south of the Volcanoes National Park, safe and easily accessible.

A contact database needs to be generated and continuously updated for the two case areas (Musanze City and Busogo) by INES and Esri Rwanda and an introductory workshop needs to be organised in which all relevant stakeholders are invited. The field data collection mainly includes surveys, in-depth interviews with key stakeholders and (area) experts, and/or focus group discussions. The field data collection activities need to be intensively managed under the supervision of KU Leuven. At the end, a finalization workshop needs to be organised in which the relevant stakeholders are invited to give feedback on research results. Key partners involved are KU Leuven, INES and Esri Rwanda, but contribution of the other partners are also needed.

In summary, the Ethiopian cases focus on peri-urban and rural land certification, the Kenyan cases address pastoralist land rights registration in the context of subdividing group ranches into private holdings – and associated land disputes with other land uses, and the Rwandese cases focus on urban and rural smallholders registration.

To note, all data collected about stakeholders throughout WP2 will be stored in adherence to the its4land Data Management Plan (D1.1) and ethics controls (WP9 Deliverables).

## 4.2 Application of research methods

The above methods description presents the ideal research design. Yet, from the case study locations it is obvious that they differ in characteristics and complexity. For WP2 it will be necessary to determine how exactly the different research methods will be applied on the different cases in a coherent manner in such a way that is feasible, integrated, valid and consistent. Therefore, for the successful application, the following conditions and prerequisites should be met.

First, depending on the case study it will be necessary to delineate the number of stakeholders to be interviewed per stage in the research design (needs; readiness; market opportunities). It is likely that certain categories of stakeholders will be more vital for the data collection in certain areas than in others. Likewise, the number of participants per category and per case area might differ as well. While operationalising the data collection, the decision will be made per case study location who and for what purpose a stakeholder will be questioned, interviewed or registered as participant at a group discussion.

Second, while the previous paragraphs explicated the background of the data collection, the application might differ slightly from the logical order presented there. It is obvious that the methods presented form the scientific and methodological background of the data collection. However, measuring needs, readiness and market opportunities will to a large extent proceed simultaneously in order to avoid questioning the same stakeholders

multiple times. Where a stakeholder might have relevance for one or more areas of interest, all effort will be made to coordinate field data collection exercises to minimise the impact on the stakeholder.

Third, though MAMCA, Readiness Analysis and gap analysis are presented as separate vehicles to measure and analyse needs, readiness and market opportunities, the integrated design revealed that there is indeed some overlap. This makes sense, because needs, readiness and opportunities are of course interrelated.

Fourth, two case areas per three countries makes six in total. While preparing the operationalisation it will be necessary to determine which and how data should be collected per case study. It is possible that the same method will be used per country, but it is equally possible that a different method will be necessary per case study. This will have to be determined in collaboration with the other consortium members during the course of the field data collection.

## 5. Task allocation among the partners

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### **KU Leuven (KUL)**

- Inform (continuously) others about the progress of WP2 ‘Get Needs’ activities
- Co-organise the Introductory ‘Get Needs’ workshops (in Ethiopia, Kenya and Rwanda)
- User Needs study – Execute MAMCA (including scenario(s) definition, stakeholder classification, Criteria/weights determination, indicators identification, analysis/ranking, reporting, and evaluations based on organised interviews with partners, experts, and key stakeholders and/or focus group discussions)
- Design and execute Readiness analysis (including definition of Readiness, stakeholder allocations, tools development, list of indicators, readiness questionnaire(s), readiness assessment scoring, readiness evaluation/mapping, and reporting)
- Market opportunities analysis – development of interview scheme, evaluation, and reporting)
- Co-organise the Final ‘Get Needs’ workshops (in Ethiopia, Kenya and Rwanda)
- Write ‘Get Needs’ report.

### **Universiteit Twente (UT)**

- User Needs study – Support implementation of MAMCA focusing on UAVs and automated features extraction and geoclouds (including scenario definition, criteria/weight evaluation, indicator allocation, participation to expert discussions, results evaluation/interpretation). Provide technical and environmental conditions regarding the use of UAVs and automatic feature extraction.
- Readiness – Support Readiness analysis focusing on UAVs, automated feature extraction and geoclouds (including readiness definition, tools developments, indicators list, readiness scoring, readiness evaluation), particularly in providing a refined recommendation pertaining to future use of the technology for relevant case areas, a range of criteria around adoption and use and implications for the country.
- Market opportunities analysis focusing on UAVs and automatic feature extraction services, but also general contribution to market opportunities analysis focusing on all four geospatial technologies.
- Contribute to ‘Get Needs’ report.

### **Westfaelische Wilhelms-Universitaet Muenster (WWU)**

- User Needs study – Support implementation of MAMCA focusing on sketchmap (including scenario definition, criteria/weights evaluation, indicator allocation, participation to expert discussions, results evaluation/interpretation). Provide technical and environmental conditions regarding the use of sketchmaps.
- Readiness – Support Readiness analysis focusing on sketchmap (including readiness definition, tools developments, indicators list, readiness scoring, readiness evaluation), particularly in providing a refined recommendation pertaining to future use of the technology for relevant case areas, a range of criteria around adoption and use and implications for the country.
- Market opportunities analysis focusing on – Contribution to market opportunities analysis (including the desired state, gap and success factor analyses, evaluation).

- Contribute to ‘Get Needs’ report

### **Hansa Luftbild AG (HL)**

- User Needs study – Support implementation of MAMCA (including scenario definition, criteria/weights evaluation, indicator allocation, participation to expert discussions, results evaluation/interpretation). Provide technical and environmental conditions regarding the use of geocloud services.
- Readiness – Support Readiness analysis (including readiness definition, tools developments, indicators list, readiness scoring, readiness evaluation), particularly in providing a refined recommendation pertaining to future use of the technology for relevant case areas, a range of criteria around adoption and use and implications for the country.
- Market opportunities analysis – Contribution to market opportunities analysis (including the desired state, gap and success factor analyses, evaluation).
- Contribute to ‘Get Needs’ report.

### **Institut d'Enseignement Superieur de Ruhengeri (INES)**

- Set up and manage Stakeholders Contact Database Rwanda together with Esri Rwanda
- Organise introductory and final Workshop(s) ‘Get Needs – Rwanda’ with Esri Rwanda
- Organise the field data collection activities together with Esri Rwanda
- User Needs study – Support implementation of MAMCA (including scenario definition, criteria/weights evaluation, indicator allocation, organisation key stakeholders interviews/ focus group discussions, participation to expert discussions, results evaluation/interpretation)
- Readiness – Support Readiness analysis (including stakeholder allocations, readiness survey/ questionnaire(s), assessment scoring, readiness evaluation)
- Market opportunities analysis - Contribution to market opportunities analysis (including the desired state, gap and success factor analyses, evaluation)
- Contribute to ‘Get Needs’ report.

### **Esri Rwanda Ltd (esri)**

- Set up and manage Stakeholders Contact Database Rwanda together with INES
- Organise introductory and final Workshop(s) ‘Get Needs – Rwanda’ together with INES
- Organise the field data collection activities together with INES
- User Needs study – Support implementation of MAMCA (including scenario definition, criteria/weights evaluation, indicator allocation, organisation of key stakeholders interviews/focus group discussions, participation to expert discussions, results evaluation/interpretation)
- Readiness – Support Readiness analysis (including stakeholder allocations, readiness survey/ questionnaire(s), assessment scoring, readiness evaluation)
- Market opportunities analysis - Contribution to market opportunities analysis (including the desired state, gap and success factor analyses, evaluation)
- Contribute to ‘Get Needs’ report.

**Bahir Dar University (BDU)**

- Set up and manage stakeholders Contact Database Ethiopia
- Organise introductory and final Workshop(s) ‘Get Needs – Ethiopia’
- Organise the field data collection activities
- User Needs study – Support implementation of MAMCA (including scenario definition, criteria/weights evaluation, indicator allocation, organisation of key stakeholders interviews/focus group discussions, participation to expert discussions, results evaluation/interpretation)
- Readiness – Support Readiness analysis (including stakeholder allocations, readiness survey/ questionnaire(s), assessment scoring, readiness evaluation)
- Market opportunities analysis - Contribution to market opportunities analysis (including the desired state, gap and success factor analyses, evaluation)
- Contribute to ‘Get Needs’ report.

**The Technical University of Kenya (TUK)**

- Set up and manage Stakeholders Contact Database Kenya
- Organisation introductory and final Workshop(s) ‘Get Needs – Kenya’
- Organise the field data collection activities together
- User Needs study – Support implementation of MAMCA (including scenario definition, criteria/weights evaluation, indicator allocation, organisation of key stakeholders interviews/focus group discussions, participation to expert discussions, results evaluation/interpretation)
- Readiness – Support Readiness analysis Support (including stakeholder allocations, readiness survey/ questionnaire(s), assessment scoring, readiness evaluation)
- Market opportunities analysis - Contribution to market opportunities analysis (including the desired state, gap and success factor analyses, evaluation)
- Contribute to ‘Get Needs’ report

## 6. Timing

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**Table 7.** Timing of actions (in months – starting with month 7 (August 2016) of its4land project)

Actions	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Field data collection																		
Contact Database generation																		
Data analysis																		
Needs synthesis																		
Scientific publications																		

## References

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- Adam, A. G. (2014). Land tenure in the changing peri - urban areas of ethiopia: the case of Bahir Dar City. *International Journal of Urban and Regional Research*, 38(6), 1970-1984.
- Alaaraj, H., and Ibrahim, F. W. (2014). An overview and classification of e-readiness assessment models. *International Journal of Scientific and Research Publications*, 4(12).
- Archer, M., Bhaskar, R., Collier, A., Lawson, T. & Norrie, A. (eds.). (1998). *Critical realism: essential readings*. London, UK : Routledge.
- Beckhard, R. and Harris, R. (1987). *Organizational transitions: managing complex change*. 2<sup>nd</sup> edition. Pearson Education Inc., Upper Saddle River, NJ.
- Bhaskar, R. (1978). *A realist theory of science*, Harvester Press, Sussex.
- Bennett, R. M., Van Gils, H.A.M. J., Zevenbergen, J. A., Lemmen, C.H. J., and Wallace, J. (2013). Continuing to the bridge the cadastral divide. *Proceedings of Annual World and Conference on Land and Poverty*, 8-11, 2013. Washington, DC: the World Bank.
- Davis, K.A. and Songer, D.A. (2002). Technological change in the AEC industry: a social architecture factor model of individuals' resistance. *Proceedings of the 2002 IEEE International Engineering Management Conference, Managing Technology for the New Economy*, 18-20 August 2002, Cambridge, UK, 1, 286-291.
- Denzin, N. K. and Lincoln, Y. S. (Eds.). (2011). *The SAGE handbook of qualitative research* (4th ed.). Thousand Oaks: Sage Publications.
- Easton, G. (2009). Critical realism in case study research. *Industrial Marketing Management*, 39, 118–128.
- Elder-Vass, D. (2008). Searching for realism, structure and agency in Actor Network Theory. *British Journal of Sociology*, 59(3), 455–473.
- European Commission. (2010). *Toolkit for capacity development*, Reference Document No. 6. Luxemburg: Office for Official Publications of the European Communities.
- Gil-García, J. R., and Pardo, T. A. (2005). E-government success factors: mapping practical tools to theoretical foundations. *Government information quarterly*, 22(2), 187-216.
- Guba, E. G. and Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin and Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105- 117). Thousand Oaks, CA: Sage Publications.
- ISACA (2016). COBIT - <http://www.isaca.org/Cobit/pages/default.aspx> (accessed 15/7/2016).
- Laarabi, A., Chevallier, J. J., and Martel, J. M. (1996). A spatial decision aid: A multi criterion evaluation approach. *Computers, Environment and Urban Systems*, 20(6), 351–366.



- Lainhart IV, J. W. (2000). COBIT™: A methodology for managing and controlling information and information technology risks and vulnerabilities. *Journal of Information Systems*, 14(s-1), 21-25.
- Latour, B. (2005). *Reassembling the social: an introduction to Actor-Network-Theory*. Oxford, UK: Oxford University Press.
- Law, J. (1992). Notes on the theory of the actor-network: Ordering, strategy, and heterogeneity. *Systems Practice*, 5(4), 379–393.
- Lincoln, Y. and Guba, E. (1985). *Naturalistic inquiry*. Newbury Park: Sage Publications.
- Macharis, C. (2005). The importance of stakeholder analysis in freight transport. *Quarterly Journal of Transport Law, Economics and Engineering*, 8(25–26), 114–126.
- Macharis, C. and Cromptvoets, J. (2014). A stakeholders-based assessment framework applied to evaluate development scenarios for the spatial data infrastructure in Flanders. *Computers, Environment and Urban Systems*, 46, 45-56.
- Macharis, C., De Witte, A., and Ampe, J. (2009). The multi-actor, multi-criteria analysis methodology (MAMCA) for the evaluation of transport projects: Theory and practice. *Journal of Advanced Transportation*, 43(2), 183–202.
- Macharis, C., Turcksin, L., Lebeau, K. (2012). Multi actor multi criteria analysis (MAMCA) as a tool to support sustainable decisions: state of use. *Decision Support Systems*, 54(1), 610–620.
- Mingers, J. (2004). Real-izing information systems: critical realism as an underpinning philosophy for information systems. *Information and Organization*, 14(2), 87–103.
- Oakland, J. S., & Tanner, S. (2007). Successful change management. *Total Quality Management & Business Excellence*, 18(1-2), 1–19.
- Orlikowski, W. J. and Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research*, 2(1), 1-28
- Porter, M. E. (1985). *Competitive advantage*. The Free Press, New York. *Technology and competitive advantage*. *Journal of business strategy*, 5(3), 60-78.
- Rayport, J.F. and Jaworksi, B.J. (2001). *Cases in e-Commerce*. McGraw-Hill Higher Education.
- Rusly, F. H., Corner, J. L., & Sun, P. (2012). Positioning change readiness in knowledge management research. *Journal of Knowledge Management*, 16(2), 329–355.
- Saaty, T. L. (1988). *The analytic hierarchy process*. New York: McGraw-Hill.
- Sayer, A. (2000). *Realism and social science*. London, UK: SAGE Publications.
- Siriba, D. N., Voß, W., & Mulaku, G. C. (2011). The Kenyan Cadastre and Modern Land Administration. *Zeitschrift für Vermessungswesen*, 136, 177-186.
- Trochim, W. M. K. (2006). *Positivism & Post-Positivism*. Retrieved August 2, 2016, from <http://www.socialresearchmethods.net/kb/positvsm.php>
- Vancauwenberghe, G., Cromptvoets, J., Bouckaert, G. and Vandembroucke, D. (2011). Social Network Analysis of the SDI in Flanders. In: Nedovic-Budic Z.,

- Crompvoets J., Georgiadou Y. (Eds.), *Spatial Data Infrastructures in Context: North and South*, Chapter 6 CRC Press Taylor & Francis Group, 121-135.
- Verschuren, P. J. M. (2003). Case study as a research strategy: Some ambiguities and opportunities. *International Journal of Social Research Methodology*, 6(2), 121–139.
- Walsham, G. (1997). Actor-Network Theory and IS Research: Current Status and Future Prospects. In A. S. Lee, J. Liebenau, & J. I. DeGross (Eds.), *Information Systems and Qualitative Research: Proceedings of the IFIP TC8 WG 8.2 International Conference on Information Systems and Qualitative Research*, 31st May--3rd June 1997, Philadelphia, Pennsylvania, USA (pp. 466–480). Boston, MA: Springer US.
- Weiner, B. J. (2009). A theory of organizational readiness for change. *Implementation Science* : IS, 4, 67.
- Wikgren, M. (2005). Critical realism as a philosophy and social theory in information science? *Journal of Documentation*, 61(1), 11–22.
- Yin, R. K. (2009). *Case study research: design and methods* (4th edition). Thousand Oaks, CA: SAGE Publications, Inc.
- Zachariadis, M., Scott, & Barrett, S. (2010). Working Paper Series Exploring critical realism as the theoretical foundation of mixed-method research: evidence from the economics of IS innovations.

# Appendix 1: Draft Questionnaire

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This draft questionnaire attempts to integrate questions from Tables 1, 2 and 4 and points raised in Section 2.3.1.

## A. Demographic information

1. Please tick **one** of the following stakeholder classes that best describes community/organisation:
  - Public sector entities (land administration specific)
  - Public sector entities (adjacent policy domains or public organizations)
  - Non-statutory entities
  - Private sector entities
  - NGOs/not-for-profit/donors and development partners
  - Research and development
2. Please tick the statement that best describes your community/organisation:
  - We have a direct role in acquiring / recording / managing / distributing (please circle as many as are relevant) land tenure information.
  - We re-use and/or add value to land tenure information to provide products and services.

## B. Current experiences

3. Please describe your community/organisation's needs around land tenure information.

What do you perceive as the most urgent need(s)?

4. What data and process challenges do you experience in meeting these needs within your community/organisation?

*Data:*

*Process:*

5. What challenges do you experience in meeting these needs at a broader level?

6. What is the main task(s) for your organisation related to land tenure information?

7. What are the main functions of this task? E.g. create polygons of subdivided parcels,

create georeferenced cadastral maps, etc.

8. What are the data and process requirements of this task? If there is more than one task, please list requirements for each task separately.

*Data:*

*Process:*

**C. Stakeholder network analysis**

9. Which other stakeholders do you interact with in meeting the requirements of this task?

10. Of the identified stakeholders, who do you consider to be a) primary stakeholders and b) secondary stakeholders?

(\*definition of primary and secondary stakeholders to be provided)

Stakeholder	Primary / Secondary

11. In the table below, please list:

- the stakeholders
- stakeholder function
- the flow of information
- how important this stakeholder is to your task.

Stakeholder	Stakeholder function R: has resources N: is well-connected RM: sets the rules V: veto	Flow of information 1 – one-way (→S; S→) 2 – two-way exchange	Stakeholder importance (Provide a weighting from 1-5, 5 being the most important)

**D. Perceived usefulness of its4land technologies and readiness for adoption**

12. According to the demonstrations of the functionality of the 4 its4land technologies, which

technology(s) do you think provides the best fit for your task(s)? Why?

13. Related to (participant to identify main task), to what extent do you agree with the following:

(1 – Strongly disagree, 2 – Disagree, 3 – Neither agree or disagree, 4 – Agree, 5 – Strongly Agree)

- I think UAV/AFE/SSM/Geocloud should replace the current method.
- I think it would be desirable to use UAV/AFE/SSM/Geocloud rather than the current method.
- It would be much better for me to use UAV/AFE/SSM/Geocloud rather than the current method.
- I will use UAV/AFE/SSM/Geocloud rather than the current method to fulfil the requirements of my task.
- My intention is to use UAV/AFE/SSM/Geocloud rather than the current method to complete my task.
- I will find UAV/AFE/SSM/Geocloud easy to use.
- Using UAV/AFE/SSM/Geocloud will enable me to accomplish my task more quickly.
- Using UAV/AFE/SSM/Geocloud will enable me to improve my performance.
- Using UAV/AFE/SSM/Geocloud will enable me to improve my productivity.
- Using UAV/AFE/SSM/Geocloud will make it easier for me to fulfil my task.

14. For the technology(s) identified in Q.9 above, have you had any prior experience using a

similar technology?

15. For the technology(s) identified in Q.9 above, given what you know about its resource

requirements, how quickly do you believe your organisation can adopt it?

16. For the technology(s) identified in Q.9 above, what do you think are key challenges/opportunities in its adoption and use?

*Challenges:*

*Opportunities:*

17. For the technology(s) identified in Q.9 above, what do you think your organisation needs to

do to support its adoption and use in the long-term?

### **E. Market opportunities**

18. In your opinion, is there a consistent short-to-medium term unmet or underserved need(s) for the its4land products in providing improved land tenure information and/or related

services (e.g. improved data collection, processing and dissemination)?

19. Who might constitute the potential market segment (e.g. industries, their size, revenue

stream, etc.)?

20. Who might supply the product and/or service and are they able to do this sustainably?

Does the market opportunity fit with the organisation?

21. Who might be potential buyers?

22. What are the potential obstacles to responding to market opportunity(s) e.g. preconditions to delivering product and/or service, product/service development requirements,

government regulation, etc.?