



Land Governance in an Interconnected World

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Assisted Community-Led Systematic Land Tenure Regularization

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Abstract

Systematic land cadastre is still an expensive and time-consuming endeavour in Mozambique. Government adopted the approach of systematic land cadastre, launching the "*Terra Segura*" Programme, to cover 4 thousand communities and 5 million rural parcels, out of an estimated total universe of circa 12 million parcels and plots.

The initial exercises to attend this massive registration utilized traditional methods of land tenure regularization, resulting in being either too expensive or time-consuming initiatives, with serious problems of data quality. New approaches were designed and tested to create an effective sustainable cadastre, proposing an holistic approach to register the land.

However, because strong evidence must be presented with regards to this holistic approach, there is a need to scale up the tests. The end goal of this scaling up exercise is to learn and disseminate lessons in local capacity development and improve the methodology and tools of the *Terra Segura* programme.

Key Words:

Land Tenure Security, Community-Based Land Cadastre Crowdsourcing, Fit-For-Purpose Land Administration.



1. Introduction

Systematic land cadastre, to comprehensively map people-land relationship, is said to be an expensive and time-consuming endeavour, thus limiting its adoption by land administration institutions. Nevertheless, Mozambique has adopted a systematic land cadastre registration, which is the goal of *Terra Segura Programme*, to cover 4 thousand communities and 5 million rural parcels, out of an estimated universe of around 12 million parcels.

The initial exercises to attend this massive registration, utilized traditional methods of land tenure regularization, which not only proved to be expensive and time-consuming initiatives, but also with serious problems of data quality.

New approaches were designed and tested to create an effective sustainable cadastre, one that: (i) is complete and accurate; (ii) provides data for management decision making; (iii) maintains data up-to-date; and (iv) is flexible enough to adjust to new business requirements (Balas et al, 2017a).

These adjustments included: (i) definition of a methodology, denominated "Harmonized DelCOM and RDUAT Fit For Purpose Methodology" that is comprised of 10 operational processes and 3 managerial processes; (ii) adjustments to the SiGIT, an ISO 19152 Land Administration Domain Model (LADM) based system, to respond to the proposed working processes; (iii) the development of a mobile application and a cloud module to capture data from the field and upload it directly into the SiGIT repository, reducing time and rejection rates through a series of quality controls and interoperability mechanisms.

The analysis of the tests and current practice suggests the adoption of an holistic approach based on 5 pillars (*Balas et al, 2017b*): (a) Standards - to speed up the process and facilitate data quality; (b) Technology (IT) - to enable, from the start, the acquisition, storage, processing, analysis and maintenance of the cadastre; (c) Awareness and Knowledge - to ensure that communities and rural dwellers end up driving the registration process rather than just benefit from the process; (d) Logistics - in order to enable effective realization, scaling and cost-



effectiveness, while ensuring incorporation of local resources; and (e) Management and Leadership - to ensure that the critical organizational and human aspects, beyond the technical exercise, are fully taken care of.

Latest experiences did follow, to a large extent, this approach. However, because strong evidence must be presented with regards of this holistic approach, there is a need to scale up the tests. The end goal of this scaling up exercise is to learn and disseminate lessons in local capacity development and improve the methodology and tools of the *Terra Segura* programme.

2. Methodology

This was a delicate exercise as systematic registration involves several stakeholders and some might have conflicts of interest. Therefore, a decision was made to conduct all the exercise without service providers and focus the attention at the community participation. A team of consultants with experience in training, sensitization, imagery and geospatial work was selected. The team had in mind that the exercise had to provide answers the following questions:

1. Is it possible to delimitate a community, involving the local council of communities, using the maps of the area, taking advantage of the limits of localities and the participation of local public administration institutions?
 - a. Identify and work with a cluster of a minimum of 4 communities in one province with at least 5 thousand households to be registered.
 - b. Obtain imagery of the area and utilize it for general boundaries identification.
2. Is it possible to develop local capacity with paralegals and community members to speed up data collection and the cadastre maintenance follow-up, enabling a different role by private service providers, such as one of supervision and validation of locally collected data?



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- a. Select a team of young members of the community with high school degree or higher, as they are more proficient with the usage of modern technology and train these to perform the work of data collection through the mobile application and available imagery, as well as in the matters of land law and systematic registration.
 - b. Train the Local Community Council (LCC) in subjects required for community delimitation and land parcels regularization. Involve these members in the sensitization and data collection process.
3. What are the best organizational arrangements at the community level to ensure their effective role in registering and maintaining their land cadastral data?
- a. The data collection process should be conducted by the trained people both from the group of youth and from the local council. The consultants would only intervene to give guidance and support (we recommend that this should be the role of services providers).
 - b. After the registration is done and the land cadastre of the community is validated, define appropriate means to leave at the community the cadastral information from this exercise (could be a dossier with all land parcels or other more modern means such a database in a device);
 - c. Promote effective and efficient ways to capture changes to the cadastre, by not only training community members (and certifying them) to perform these updates but also by ensuring a higher interaction between all the stakeholders in the approval process until the change is authorised by Government entities.
4. Can we adjust and optimize the current processes and tools, so that the exercise of community delimitation occurs beforehand in a shorter lapse of time, followed by individual parcels registration and only then start with the design of development plans



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and natural resource management plans, eventually using corrected free imagery, such as those provided by Google maps?

- a. Utilize free maps (any available) right from the beginning to allow the community to define the general boundaries, even if they are just an initial attempt. Get appropriate geospatial information of vertices of cross-borders between the communities and other information that is available. From specific geospatial information, print more detailed maps and use them to define specific and definitive boundaries. If this is not sufficient to visualise a specific boundary, go to the field and get specific coordinates for that area. This should result in a detailed map of the boundaries of all communities.
- b. Where there are conflicts that cannot be resolved, leave a buffer in that area and delimitate the remaining area. That specific area should not be part of any map of any community delimitation.
- c. From the moment inter-community limits are defined, proceed with the community diagnosis but having in mind that this should be high level exercise at this stage (land uses and their location, location of infrastructures, population density in each area). This will allow a high level zoning the community. From the high level zoning, define cadastral blocks for parcel registration.
- d. Having defined the cadastral blocks, proceed with parcel registration according to the plan defined by the community. Based on a specific detail captured for each parcel (community where it belongs), adjust the boundaries of the communities.
- e. Only after the parcel registration is complete shall the zoning be updated with more accurate information of all land uses within the community.
- f. If the registration process includes defining the natural resources development plan for the community, then there is now enough information to promote these plans.



All the proposed activities must be harmonised with the working processes for community delimitations and individual parcels regularization, therefore, the team had to:

- i) follow the Delcom and RDUAT Processes (Figure 1: The DelCOM and RDUAT Fit For Purpose Processes), with special attention to the first six processes where communities have a more participatory role;
- ii) observe each of the five pillars that are considered critical to the holistic approach; and
- iii) provide recommendations to improve and/or adjust the DelCOM and RDUAT processes, tools and materials.

3. Field Work - following the proposed processes

As mentioned before, the first six processes for community delimitations and individual parcel regularizations were followed. This chapter describes the work performed in each of them.

3.1. Prepare Work

This process includes two main activities: plan the field work and mobilize and prepare field teams.

3.1.1. Plan the Field Work

1. The first step was to select a working area with at least four (4) communities. A locality was selected in Gaza province, south of Mozambique (Figure 2: Locality of Chicuangue, Administrative Post of Chidenguele, in Madlakazi District).
2. Simultaneously, information was requested to the National Statistics Institute. This resulted in being a difficult task to gather information from another



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Government institution. We were only able to get data from the amount of inhabitants, which is 9.565 (4364 men and 5201 women)¹.

3. The Government authorities (district, administrative post, locality) were informed by the provincial land office. Initially this was a problem as communication did not occur smoothly and authorities were not in favour of the work due to the lack of information. Additional effort had to be made to acquire their commitment and support.
4. A meeting was setup with the local community council, where the work was explained to all members. This proved to be very productive and important to gain buy-in from all involved.
5. Based on the map of the area, communities indicated the general boundaries of each of them. It was then clear that we locality was comprised of eight communities, and eleven neighbouring communities (Figure 3: General Boundaries based on initial discussions).

These activities occurred in a period of a week.

3.1.2. Mobilize and prepare Field Teams

This activity normally occurs focusing on training services providers. In this exercise, the idea was that the community would execute the work and therefore a team comprised of people from the community was selected. The community provided a church for the training.

1. The first step was to select young members of the community that had completed high school and that were trusted by the community. A group of 15 people was selected and trained intensively (Figure 4: Young members of the community being trained to become data collectors) in the matters of:

¹ National Statistics Institute, statistics from 2017 census.



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- a. land law (good faith and customary practices, land use types, gender and vulnerable groups, protection areas, amongst other aspects relevant for the work)
 - b. procedures to capture cadastral data
 - c. mobile application operation
 - d. imagery interpretation
2. The second step was to train all members of the local community council. In this training, only the mobile application training was skipped as these members are mostly elderly people and have difficulties in using technology. The young members also participated in this training and helped clarifying doubts of the elderly people. A group of eighteen (18) people were trained (Figure 5: Training the members of the local community council).
 3. Training included practical work with several scenarios that are common in the systematic registration process (cases of orphans, widowers or women with an absent husband living in another country, elderly people, multiple wives, several siblings, conflicts of boundaries, men that do not wish to share tenure with the wife, inappropriate or forbidden areas by law, protection and expansion areas, and other scenarios indicated by the community).

This exercise lasted a week, including the weekend as these were days with more people available to work with.

3.2. Prepare Communities

This process includes two main activities: Sensitize and Prepare Community and Execute the Rural Participatory Diagnostic.



3.2.1. Sensitize and Prepare the Community

This activity is normally performed by the service provider. In this exercise, the idea was that the members of the community council would execute the work, after appropriate training was given to the members of the Community Council. This not only proved to be more productive because the community trusts their own members to bring in the new message, but also creates a sense of ownership and commitment.

1. A public meeting was scheduled with all communities involved. The meeting was setup to occur in the center of the locality to allow people from far distances to participate. Figure 6 illustrates this public presentation meeting.
2. The team was introduced to the community members. Government was represented by the Chief of Administrative Post and Chief of Locality. All members of the community council were present. In this locality, there are two 1st degree leaders, two 2nd degree leaders, and eight 3rd degree leaders. Apart from these, there are also block chiefs.
3. The meeting lasted two hours and community members presented their doubts and concerns with regards to the process.
4. In the meeting, communities decided that:
 - a. The registration process should occur in all eight communities and not only in the initially defined four communities. This was a condition to execute the work as they did not want to differentiate some communities from others. They also requested that all parcels would be considered and not only some land uses such as cassava plantations.
 - b. Each household would compensate the community team with the amount of 1.5 USD, and this would occur during the act of registration, for parcels that were not located in exclusion areas and not in a conflict. The money would be a small contribution to ensure that these teams would be willing



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to work intensively in the registration process and would not be penalized from not performing their normal activities. The management of these compensation fee would be left to the community teams. Community also offered to provide food to the consultants while working in the field as a token of appreciation.

5. This exercise of presenting the project to the communities was then replicated over the following two weeks within each of the communities so more people would be involved. Second degree and third degree leaders had the mandate to spread the word and obtain commitment from all members.

The Public meeting was scheduled one week in advance, right from the moment we started interacting with the community. The following public meetings occurred over a period of two weeks within each of the eight communities.

3.2.2. Execute the Participatory Rural Diagnostics

This activity at this stage is only the initial diagnosis. Further work must be done after the registration process is concluded to detail the zoning of the community. The intention at this stage is to have higher level information with regards to limits of the communities, land uses within the community, population concentration areas. This information will help planning the field work for parcel registration.

1. Based on some discussions over a map, and by collecting some vertices of the borders it was possible to draw on a map all eight communities. Communities were advised that this was just a sketch of their boundaries and that specific work would have to be performed to define the definitive boundaries after more detailed images would be obtained (Figure 7).
2. From the initial boundaries, and from the geospatial information gathered during the previous work, more detailed maps were printed and these were presented



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both in paper as well as projected over the wall in the church were meetings occurred. More detailed boundaries were then delineated by the community members (Figure 8). There were conflicts over the land that more touristic infrastructure exists and therefore no agreement was made over a specific area.

3. A proposal was then made that each parcel should have a tag with the name of community where it belonged. This would support the design of final boundaries as well as the management of the community land cadastre. For this purpose, the mobile application, the API² and the SiGIT application had to accommodate this new requirement.

This initial sketches of the communities boundaries were done over a period of a week, involving the local community council. After the Public Meeting, three more sessions of discussions occurred combined with visits to the edges of each community with the neighboring communities. In total two weeks were spent in this exercise. What took more time was the conflict over territory between two communities: Mbahanine and Chizavane, and Chizavane and Chicuangue, since they all claim the land of Chizavane beach resorts. The conflict is still not resolved and a decision was made not to work in the area where it exists.

3.3. Collect Data in the Field

This process includes two main activities: Prepare Field Devices and Collect Field Data.

The most difficult task was to obtain high precision maps to insert into the mobile devices. The work was to get enough reference coordinates that would allow for more detailed images of the selected areas. This work is time consuming as it would take 3 days per community and would require a differential GPS .

Five teams were established and a plan was delineated to start in one area of a community. After some experience was gained in the terrain, the teams would then spread over several cadastral

² Application Programming Interface



blocks. Each team was comprised of three or four elements: two (2) young members from those trained; one (1) local leader and/or one (1) chief of area that knows each inhabitant of that specific area.

3.3.1. Prepare Field Devices and Synchronize with SiGIT application

1. The team prepared several images with enough resolution for designing parcels in the mobile device.
2. A total of 5 devices were prepared with detailed images of the working areas planned for each team. Each device was synchronised with information already available in the cloud for this exercise (project, cadastral blocks, users).
3. A registration kit containing: (i) detailed maps for each cadastral block; (ii) ropes with 5, 15, 30 and 50 meters to measure exclusion areas according to the law; (iii) tickets with parcel numbers to be provided to each registration; (iv) templates for witness document issuing; (v) booklets to register specific details of each registration for community control.

3.3.2. Collect Field Data

1. First, maps of the area were analysed to verify what areas would concentrate higher efforts for registration.
2. Second, a plan for all teams was established and communicated to the communities. Communities then informed community members of the plan so people would be present when visiting the parcel.
3. Only after these two steps were finished the teams started the field work. When parcels were visible, drawing over the map was possible, but in general this was not feasible as limits of houses and farms were not clear and the team had to walk



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around the edges of each parcel. The average rate of individual parcel collection is 15 parcels per day per team.

4. One important aspect was the concern that there could be fraud in registering parcels. A decision was made that for each parcel registered, a picture would be taken with the title holder(s) plus the local chief showing the parcel number. This would support evidence of who worked in that specific parcel (Figure 9: Parcel registration proof with local leader, chief of the block and a couple (part of the training simulations)).

The field work is still going on within the communities.

4. Observations of the 5 pillars

1.1. Standards: Promoting the Harmonized Methodology for Delcom and RDUAT

In what refers to standards, the DelCOM and RDUAT Methodology was revised not only to: (i) harmonize community delimitations and individual parcel regularizations but also to: (ii) promote a more participatory and all-inclusive bottom-up cadastre and land management, both for legal compliance and for a matter of feasibility of the entire endeavour, in a fit for purpose approach, as recommended by Enemark et al, (2016).

Based on the results from this exercise we can propose that the role of the service provider should be of the training the community and supervising the work and validating the data collected, and the role of the community should change to a more participatory one, including involving local community councils and members of the community for data capturing and for sensitization, and to take charge of the information on changes in rights, hence decisively contribute to keep the cadastre updated. This however is possible only if the second pillar (ICT) is in place and completely aligned with the methodology as there is a need for imagery and mobile application to be made available for field work and consequent download into the main



cadastral system SiGIT. Another suggestion is the utilization of details of parcels to delineate more accurate boundaries of communities.

1.2. ICT Support: Adjustments to SiGIT and to the Mobile application

The exercise illustrated that using the mobile application allowed community-based crowdsourcing data acquisition, as recommended by McLaren (2016). This was also possible because imagery had sufficient detail for community delimitation and parcel registration. However, we must emphasize that it was not an easy task to get images with sufficient details for drawing parcels over a map. The imagery team did a spectacular work with freely available images. This difficulty could be overcome if high precision images are made available for the "*Terra Segura*" program. If images are not available, then a recommendation would be to capture geospatial information using a GPS linked to the mobile device via Bluetooth (precision would need to be revised as sub-metric measurements require more sophisticated and expensive GPS devices), or to utilize drones to capture more detailed information.

Another important aspect was the fact that the SiGIT mobile application is fully integrated with the SiGIT application and has embedded all quality controls required by the land system and land law. Integration of parcels already captured was smooth and easy, albeit communications not always working in our favour.

1.3. Training: The importance of including members of the community

Awareness and training is being done for quite some time aiming at public communication, officers training and managers' education, to ensure free and informed consent and participation of communities. Paralegals are said to be present in a significant number of communities. However, when trying to find these paralegals, they were not available within the communities involved in this exercise.

We recommend that training should be promoted within the community, from scratch, involving community councils and young members with education (at least high school). In this exercise,



the community members were trained in data acquisition skills, map-reading and manipulation, enquiry techniques and the operation of the hardware and software involved, as well as techniques to ensure data quality and reliability.

We also advocate that we should provide managerial training to community leaders so that basic organisation practices and planning concepts to ensure they will promote the continuous and systematic execution of the various activities for land registration.

1.4. Logistics: Achilles Heel

In terms of logistics, the current practice is to procure service providers, which increases substantially the costs of field work. This is based on the assumption that local capacity is absent or that communities do not contribute for the registration process.

A very pleasant surprise was the fact that communities were willing to contribute a small amount of money to pay for the work of their own members that were working in teams to register actively all households and farms. This would allow for a continuous registration process, at the pace of the community.

In this exercise, the role of provincial and district offices should have been one of monitoring and control. And this did not work well. Training was given to these officials so that they could follow the exercise entirely and participate actively in the monitoring and control. However, when in the field, logistics for these teams participate in the exercise were not provided which posed a serious threat to the endeavour.

Given the sheer breath and scale of such endeavour, logistics deserves to be treated separately, and changes are needed if "Terra Segura" is to succeed.

1.5. Leadership and Management: A Change Management Issue

Changes in management and leadership – and the management of such changes – will better prepare the land administration institutions to open-up to new ideas and approaches involving



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simultaneously tens of institutions and communities, while keeping quality standards in data and processes. Without a management system that controls and disciplines the deliverables by each role no great results should be expected. Part of this pillar is the need to establish a more collaborative culture among all participants and stakeholders.

Our experience working with district authorities was very positive. However, we do recommend a more active role of these authorities since there is a need to supervise all projects being run simultaneously at a certain district.

5. Conclusions

In this chapter we will provide answers to the questions formulated before starting the field work.

1. Is it possible to delimitate a community, involving the local council of communities, using the maps of the area, taking advantage of the limits of localities and the participation of local public administration institutions? **YES**. This exercised proved to be possible.
 - Maps allowed to have an understanding of the area and the communities involved. Initially only sketches were drawn but after getting more detailed images and after visualizing the parcels of each community, it was possible to delimitate in detail each of the communities. Conflict areas were left out until an agreement or solution was achieved.
 - The entire locality was actively participating in the delimitation process, including district administrators, chiefs of posts and chief of locality.
 - From the exercise we found out an error in the official maps which will be possible to correct based on the new limits defined by these communities. This seems to be a common error and it must be dealt with appropriate procedures.



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2. Is it possible to develop local capacity with paralegals and community members to speed up data collection and the maintenance follow-up, enabling a different role by private service providers, such as supervision and validation of locally collected data? **YES.**
 - Members of the community council were trained not only to ensure free and informed consent and participation from all communities' members but also to participate actively in the data collection process.
 - Although we could not work with paralegals from the community, we were able to work with students (high school and university) and train them as paralegals. Their role was to support the members of the community council in the systematic registration and utilize the mobile devices and images to register each parcel of the community
 - In this exercise, the role of the consultants, including district and provincial officials, was purely the one of training the community and monitoring and control the work performed. We recommend that this should be the role of the service provider.

3. What are the best organizational arrangements at the community level to ensure their effective role in registering and maintaining their land cadastral data?
 - The first recommendation would be to organize the cluster of communities within one locality so that the delimitation work focus on the entire locality covering therefore all 3rd degree communities.
 - Secondly, we would also recommend that the entire work is done with the Local Community Council, and not only with some of the leaders. Having a council working together promotes more open and transparent discussions and saves time when delimitating communities.
 - Third, we would recommend that the results of these registrations (both communities delimitations and individual parcels registrations) are left with the communities,



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being one copy with the locality, and one copy with the community authority. It is important to train these leaders in aspects of cadastre updates and update procedures (that are still to be defined if this proposal is accepted). Communities must be informed, when titles are delivered, that any changes must be communicated to the community authority.

4. Can we adjust and optimize the current processes and tools, so that the exercise of community delimitation occurs beforehand in a shorter lapse of time, followed by individual parcels registration and only then start with the design of development plans and natural resource management plans, eventually using corrected free imagery, such as those provided by Google maps? **YES**
 - This exercise was done following exactly this recommendation. From previous exercises, the entire community delimitation including social preparation and development of natural resources plans would take on average nine (9) months. Actual delimitation would only occur after three months and would last about one month.
 - In this exercise, all eight communities were delimited within a period of a month of work, which included training and social preparation. From this point in time, individual parcels registrations especially at the borders took place. This might take long depending on the size of the community. However, after having more detailed boundaries, it is now possible, while still registering land parcels, to start discussing development plans for the community and their natural resources plan, since it is clear what the limits are and what exists within the community.
 - Some inter-community conflicts cannot be solved quickly. In that case, an approach needs to be generally adopted on how to proceed, in view of keeping with the expectations of those not in conflict.



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- One concern from our team resides within the fact that when communities start trying to get economic benefits from investments in a certain region, they all claim that area. We would recommend that benefits should be carefully analysed and compensate the entire locality instead of one single community (examples of this are the schools and health posts that need to exist all over the locality and not concentrated in one single community)



5. Way forward

Based on the evidence from this work, we do advocate that it is time to disseminate the revised methodology as a standard for massive land registration. It is better to start somewhere and evolve in a continuous quality cycle, the only valid approach to justify the building of the next best version.

We also advocate that the communities must be more involved. Results from these exercise illustrated that community members can be trained in aspects of land law, sensitization, gender and vulnerable groups. Young members, those with high school degrees can be a valuable contribution for the data collection process, especially in the usage of the modern technology such as mobile devices and imagery for parcel drawing.

Additionally, and because community members need to be compensated for the work being performed, communities can organise internally the payment of a small fee for each registration being made. This amount is insignificant for most but it is a small contribution from the community to the community and it allows more commitment from those involved in the registration process.

One important aspect of the ICT pillar is the fact that technical assistance and support which if not available will pose serious constraints to the entire operation. SiGIT availability must never be a constraint but only a means to achieve the expected results. Another issue is the availability of connectivity to increase data transfer from the mobile devices to the cloud and from the cloud to the SiGIT database. The mobile application must be made available to this systematic registration process, but the National Directorate of Land must ensure its correct usage and maintenance.

Last but not least, it is important that the validation of the data collected in the field is done in a very careful way, not only by monitoring the work in the field but also evaluating the quality of the data collected and promoting corrections and adjustments when and where needed. This must not ever be neglected. More information and recommendations with regards to the last four



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processes of the methodology will be provided after the execution and conclusion of these activities.

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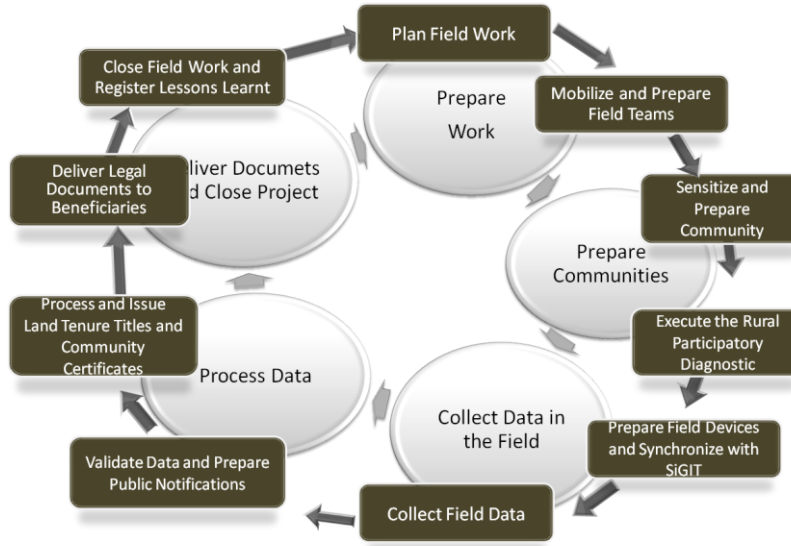


Figure 1: The DelCOM and RDUAT Fit For Purpose Processes

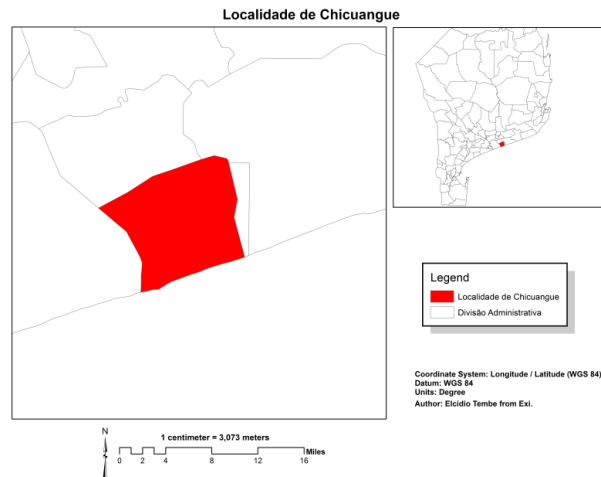


Figure 2: Locality of Chicuangue, Administrative Post of Chidenguele, in Madlakazi District



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Figure 3: General Boundaries based on initial discussions



Figure 4: Young members of the community being trained to become data collectors





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Figure 5: Training the members of the local community council



Figure 6: Public Presentation meeting



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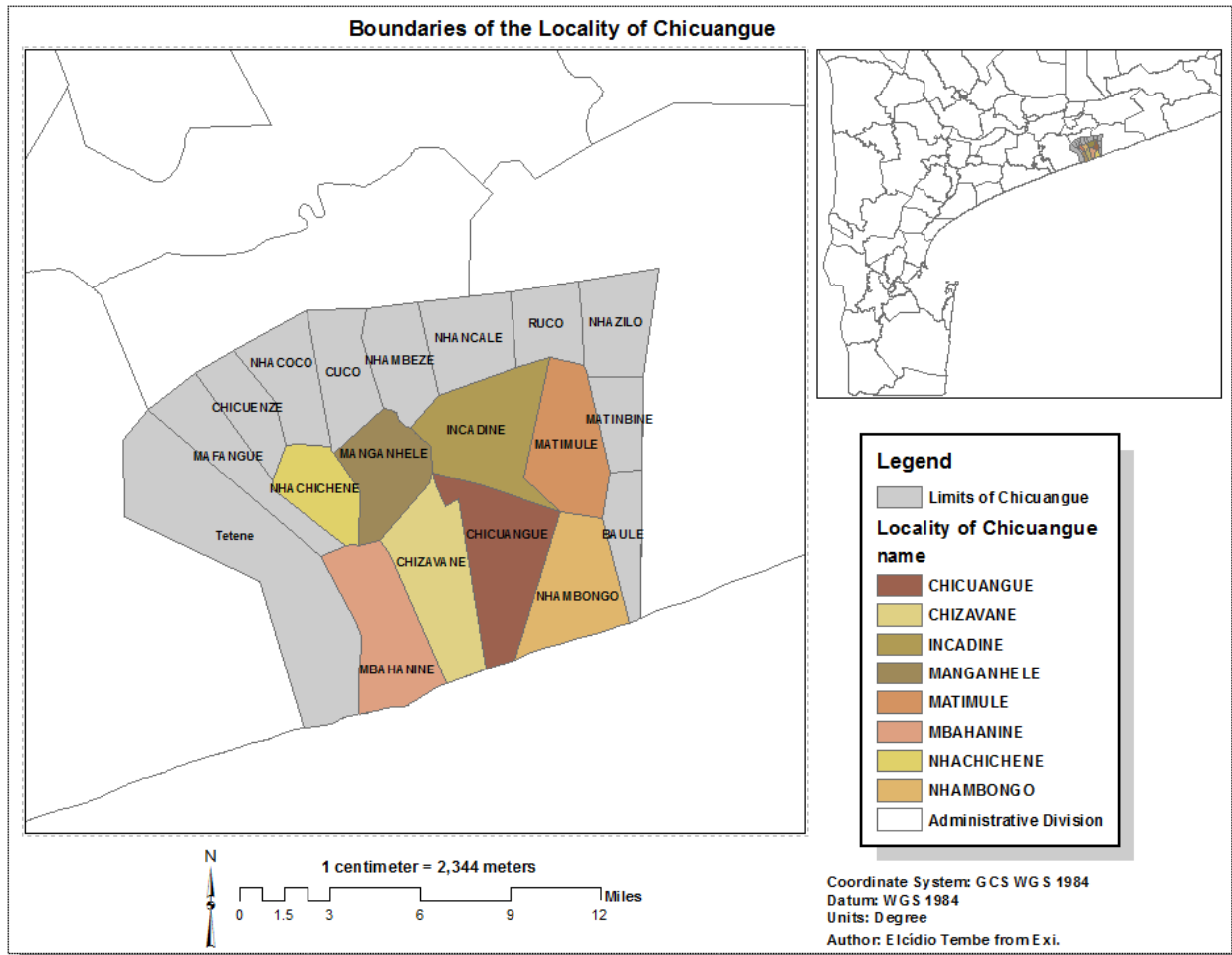


Figure 7: Sketches of the limits of the eight communities and their respective neighbors



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Figure 8: Getting the specific boundaries of the eight communities



Figure 9: Parcel registration proof with local leader, chief of the block and a couple (part of the training simulations)