IMPLEMENTATION STRATEGY FOR LAND ADMINISTRATION IN MOZAMBIQUE

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Abstract

Land administration in Mozambique needs to become less bureaucratic, simpler, cheaper and more transparent. Design and implementation of traditional approaches is so time consuming that land laws are to be adapted to provide for simpler procedures. Delivery of results (maps, DUATs[1], spatial plans) requires unconventional approaches, both conceptual and technological.

This paper proposes an implementation mechanism for the Land Sector Strategic Plan in Mozambique. A clear priority is identified in this proposal: DUAT production for 5 million parcels before 2025 combined with an land administration organisation where maintenance can be performed. This allows for the future development and introduction of a more comprehensive land governance[2] in the related areas.

Land administration is considered as a business that operates within legal frameworks. Topographic mapping and land use planning should be included in this business approach.

It is considered that the implementation of the Land Sector Strategic Plan of Mozambique can be achieved by one unique, single organisation for land administration and topographic mapping operating at different levels of administration.

Key Words: Land Administration, implementation, Mozambique

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[1] DUAT, from the Portuguese Direito de Uso e Aproveitamento dos Terras—'right of use and benefit of land.'

[2] Land governance systems have two important aspects: administration and management. Land administration (*legislative package, land valuation, collection of fees, taxes, rights, cadaster, regularization, etc.*) is part of the infrastructure that supports good land management (*form of land/use, planning, land-use planning, conservation, construction planning, regulation, implementation, resettlement, development, etc.*).

1. Introduction

Land administration in Mozambique needs to become less bureaucratic, simpler, cheaper and more transparent. Design and implementation of traditional approaches is so time consuming that land laws are to be adapted to provide for simpler procedures. Delivery of results (maps, DUATs, spatial plans) requires unconventional approaches, both conceptual and technological.

This paper proposes an implementation mechanism for the Land Sector Strategic Plan in Mozambique. A clear priority is identified in this proposal: DUAT production for 5 million parcels before 2025 combined with an land administration organisation where maintenance can be performed. This allows for the future development and introduction of a more comprehensive land governance1 in the related areas.

Sound policy and decision making with respect to the use and planning of land in Mozambique is based on a geographic knowledge of the national territory. Reliable geo-spatial information is essential for a well-functioning government, private sector and society in general. To achieve reliable geo-spatial information, topographic data should be that widely accessible at different scales, and integrated in one platform with cadastral data and land use data.

In this context, land administration is considered as a business that operates within legal frameworks. This business approach would imply cost recovery where possible and transparency in execution of the business. Topographic mapping and land use planning should be included in this business approach. However, additional budget may be needed in these areas – because cost recovery may be difficult to achieve here.

Implementation of the Land Sector Strategic Plan can be achieved by one unique, single and autonomous organisation for land administration and topographic mapping. This organization has to be developed. The National Directorate of Land (DINAT) (under the Ministry of Land, Environment and Rural Development) and the Provincial Geography and Cadastre Services (SPGC) are proposed to be brought under this organisation. Inclusion of the Land Registration (under the Ministry of Justice, Constitutional and Religious Affairs) into this organsation may be

considered. It is advised to develop this autonomous organisation further with the National Centre for Cartography and Remote Sensing (CENACARTA) and the NationalDirectorate of LandPlanning and Resettlement (DINOTER). In this way, a nationwide Cadastre, Land Registry and Mapping Organisation (CRMO) appears.

The main objective of a CRMO is to provide services and customer satisfaction. In this way, a CRMO will be widely accepted amongst its users as the authority providing tenure security and as a partner in business providing land and spatial information from a national platform. The CRMO will be a user- and demand driven organisation. A CRMO User Community will consist representatives of planners and developers of cities, experts in transportation and logistics, agricultural planners and monitoring experts, experts in statistics, mortgage providers, valuers and tax collectors.

For the production and for the future maintenance of 5 million DUATs (immediately followed by a programme for 10 million DUATs), resources and financing is needed. Financing based on a cost recovery approach is proposed – at least for land administration. This could be based on an annual 'land administration' or 'cadastral' fee for DUAT holders.

Land-administration organisations in Mozambique put much effort in determining, registering and disseminating information on the use of land and ownership of buildings. The large amount of data involved, is subject to many changes. This data needs to be kept up to date and must be accessible for retrieval. Consequently, operations can only be carried out efficiently and effectively with ICT support. However, the question raises on what is the appropriate approach to organisational objectives in relation to the opportunities offered by ICT. A strategic alignment between business and ICT is needed.

In this implementation mechanism, the following key elements are considered for the reform of the land sector:
- Land cadastre
- Cartography, land use planning and resettlement
- Improvement of the land information management system (SIGIT)

- Institutional development, infrastructure and training
- The Legal Policy Framework

These elements will be discussed in this paper.

2. Land Cadastre

2.1 As is situation

In the past two decades, appropriate legislation was enacted to protect the poor and the communities. However, most land, more than 90%, is still used under unregistered good-faith occupations and customary tenure arrangements. This limits equality in access and security of land tenure. Especially, the country's ability to make appropriate reforms is weakened due to poor information on land use and land rights.

At this moment, the organisation for the land cadastre looks like an archipelago. Mandates and responsibilities are widely distributed. The Land Administration organisation is designed for paper based approaches – not at all for digital approaches with computerised workflows formaintenance or for provision of platforms and services.

Land administration is not very well accessible for citizens. Especially in rural areas, offices are located far away. This constellation does not allow a scalable approach in data acquisition for DUAT production within the defined time horizon of 2025. Inter-organisational workflows have a huge impact on the performance of the data collection and of the DUAT provision. The existing of workflow needs to be simplified substantially.

2.2 To Be situation

The Land Cadastre and the Property Register is under the responsibility of the CRMO. The Land Cadastre and the Property Register establish the Land Administration – where possible operating under cost recovery. This requires some level autonomy for the CRMO (which is possible to organize in Mozambique).

Main priority for the CRMO is having 5 million DUATs available in 2025 in a land administration organisation where maintenance of the land administration can be performed. Maintenance is needed because the relations between people and land are dynamic. Production and successive maintenance of DUATs will be done in a well accessible National Land Administration database with land data and services for maintenance and updating. Then there will be follow up for 10 million more parcels between 2026 and 2030. Tenure security is relevant for investments and developments based on planning approaches. The CRMO is expected to operate all its land information digitally. Continuity in the availability of a land management information system is crucial. Certified capacity is only available in case of competitive salaries of staff – especially for the ICT support. Per the strategy plan for the Land Sector there is a need for reform and capacity building of the land administration and management system. Per the plan this is a multidimensional task requiring a systematic approach and the concentration of resources at the most strategic entry points – combined with the establishment of an autonomous institutional framework, with human, material, and financial resources. As well as a physical and communications infrastructure that is appropriate to the size and complexity of the Land Sector at national level. New methodologies and technologies are needed to make the DUAT production and maintenance sustainable, expeditious, accessible and relying on simplified procedures.

Making a complete overview for 5million parcels of all existing people-land relationships, as occupancy, informal and customary land use is the 'starting point' in the implementation of land administration. Creating an overview of the existing land tenure situation includes overlapping claims on land use, disputes and conflicts. It is crucial to get an overview of spatial units which are under dispute on a map. In this way, dispute resolution can be organised. This overview of disputes may include conflicting DUAT assignments based on decisions from different governmental levels.

The initial data acquisition will be done in the field and in the villages with participation of all land users. The government – represented by CRMO officers – will be present in the field. For this reason, CRMO should be organised as a strong, autonomous and single organisation with a clear mandate and well developed functional command lines, focussing on customer orientation and

product and service delivery. The organisation should operate at national, provincial and local level. Local offices should be located at places that meet customers demand. There is no need to link to administrative division to location of local offices.

The CRMO should operate on cost recovery basis – this implies that costs of producing the DUATs need to be paid by the citizens. Recording millions of people-land relationships will provide a stimulus for a growing land market. Maintenance costs can be compensated from an annual fee. Costs will be at the lowest possible level – by designing a minimal viable product without unnecessary attributes and process steps.

Note: a similar approach (paper based) as described below was tested earlier by DINAT. The full digital approach, for example with SIGIT Mobile or other mobile applications for land administration, requires simplified workflows with minimal numbers of attributes. This requires testing and piloting.

2.3 Methodology for DUAT data acquisition: digital approach

A digital, App based, methodology will be used for initial data acquisition: cheap, fast and good enough. Fieldwork will bring a complete overview of all existing people-land relationships in the selected areas of data acquisition. Area selection, transport, awareness raising, field work, local review, data handling and publication needs to be organised. This work can be outsourced. Logistic experiences from within National Statistics in the 2017 Enumeration need to be re-used in the organisation of fieldwork. Formal co-operation is needed with this organisation for this purpose. In all cases government officials need to be involved in all field work – to sign DUATs and for decision making conflict resolution in co management with local and traditional authorities. Co-management means that a trained governmental representative will solve conflicts (where possible) together with local authorities. If conflicts and disputes cannot be solved a next step will be the court.

The local authorities are informed in advance and are involved in the organisation of awareness sessions. Fixed programmes and promotion materials are being used. Projectors need to be available.

Transportation is expected to be the main cost component in DUAT production. Calculations are based on field transport with 7 person cars: 5 teams – each team consists out of 1 person –, 1 government representative and 1 driver.

Land users are invited during the fieldwork to walk the perimeters of their parcels with a GPS antenna. They point the vertex points of the boundaries themselves. A grass root surveyor records the observations with a mobile application. This application comes with the satellite image of the area2. Data collection is done in an integrated way: the perimeter is stored together with a photo of the users and a photo of the id of each user.

Women's access to land is the key issue here. Shares of women in land use will be included in the inventory. This is more relevant then high geometric accuracy! If someone already has a DUAT, a photo of that DUAT will be taken. Community involvement is the basis for success; the very nature of cadastral survey requires the participation of neighbours, family members, etcetera. Important to note; Collected boundary data are also superimposed on the satellite imagery. This allows easy interpretation by the local people. Many of the boundaries in rural areas in Mozambique are visual boundaries and thus easy to identify in the field and on the imagery. Those visual boundaries are identified in the field and then 'drawn' and/or 'digitally drawn (with the App)' on top of satellite imagery. It is important to get overview of the plots with a highly reliable link to the type of right and its right-holders – male and female. Placing beacons and producing highly accurate surveys may be done later during the maintenance phase if needed.

There will be a local review on the collected overview of land use by the community. This review will be organized by the data collectors together with authorities from a (newly established) local CRMO office – if possible supported by cloud based services; this depends on the availability of telecom. The local CRMO office head signs the DUATs – with stamps after payment by the DUAT

holder. This brings validity – and from this moment on a Cadastre tax or annual subscription must be paid.

A cloud service brings the advantage that data is managed from one place: all data are stored into a central database. During field work, disputes are mapped for resolution. A zoning overview of the existing situation in land use must be prepared in the field by governmental officials. Among other things this overview will represent housing, agriculture, roads, services, etc. Where possible topographic maps will be used for this purpose.

After field data collection, the data need to be checked on completeness and need to be prepared for DUAT production. Since perimeters have been walked for all parcels, there are two observations for each boundary. The average lacation can then be calculated, if observations are within sub metre tolerances. Overlapping claims in land use or overlapping DUAT assignments will be visualised on a conflict map. The conflict map is a 'what to do map' for people involved in conflict resolution. Conflicts need to be solved – based on conventional procedures. A first step may be finding agreement based on mediation in the field by government representatives in co-management with local authorities.

After this process, the DUATs can be published. A newly established local office of CRMO is involved in this process of publication. This is important because the process of DUAT production and conflict resolution run in parallel.

Note: it can be considered to leave a paper image with the boundaries included can be left with the people. This needs further discussions – this option is not yet included here.

2.4 Maintenance

When parcel data are available, a maintenance organisation needs to be in place for that area. This means a local office is established and functioning before the first review in an area of data collection is organised. The review will be organised by the data collector team together with authorities from the local CRMO office and in co-management with local leaders.

All DUAT assignments will be managed by the CRMO. Conflicts between assignments from different 'levels' in the hierarchy of the government will be avoided in the future due to the available digital land information.

2.5 ICT Support

Computerising data acquisition is based on a mobile application, for instance the Collector App from providers as Esri, or others like EXI. This allows for very efficient data collection. The App will be used in combination with a GPS device for sub-metre accuracy, via a Bluetooth connection. The interface between the GPS device and the Collector App can be managed from a smartphone or tablet.

Lightweight devices in the field are very efficient to use in Mozambique. In addition, the tools and technologies to develop the application are known inMozambique. The GPS device requires a correction signal for correction of atmospheric distortions of the GPS signals. Sub-meter accuracy is sufficient. High geometric accuracy is not needed in this stage – in case such signal is available from a working Continuous Operating Reference Station it can be used of course.

The use of cloud services may mean data are stored outside the country. Arrangements may be needed to avoid this.

2.6 Cost Calculations Land Cadastre

Cost calculations include training and education for the data collectors, transport, salaries, daily allowance for the data collectors, devices (mobile, gps antenna), awareness raising, data collection, data handling. Costs are estimated to be around 15 – 25 USD per signed and distributed DUAT.

The calculated 15 – 25 USD per signed DUAT is based on the assumption that imagery is available. Fees for the production and maintenance of DUAT's should be brought into discussion. This will generate revenues. At some point costs could be in balance with the revenues

Action points for DINAT:

- Organise political support for integration to a single and unique autonomous organization at central, provincial level and local level

- Identify the locations of offices for maintenance. Locations can be based on distance criteria

- density of land information. There is no need to align to administrative division of the country

- Improve and densify the geodetic reference network, as a solid base for reliable topographic mapping, but also any other field survey work (land cadastre and land registry, agriculture, statistics).

3. Cartography, land use planning and resettlement

3.1 As Is Situation

In Mozambique, the National Centre for Cartography and Remote Sensing – CENACARTA – is the responsible organization for the production and maintenance of topographic maps, and remote sensing products and services, satellite and aerial imagery and the spatial data infrastructure (SDI). Currently, a big part of the country's topographic information is more than 40 years old. In some areas in the north of Mozambique, topographic information is not even available. Currently, both production and maintenance of these products and services suffer from a lack of resources and skilled personnel.

In 2015, a project led by South-Korea, started to map the Zambezi Valley at a scale 1:25,000, covering around 220,000 km2 of terrain. This project will end in 2017, delivering detailed topographic information of roughly 25% of the territory of Mozambique.

To produce a topographic map of Mozambique, the production capacity of CENACARTA must be enlarged extensively. A production plan for topographic mapping need to be set up. This production plan can be (partly) based on continuation of the experiences of the mapping project of South Korea.

Land use planning is institutionalised but not implemented in practise. There is a need for topographic maps as base materials for design and implementation of spatial plans. There are ideas for participatory planning – but not yet implemented.

3.2 To Be Situation

Cartography (topographic mapping), land use planning and resettlement under the responsibility of the autonomous CRMO. Cartography (topographic mapping), land use planning and resettlement are operating as a normal business – as far as possible under cost recovery – it is expected that budgets are needed for topographic mapping and spatial planning activities.

Integration of CENACARTA with other organizations like DINAT for land administration and DINOTER for land planning and resettlement, in an autonomous 'Land' organization; see chapter 5. Main goal is to realise a country wide availability of reliable topographic information in 5 years' time, starting by training courses in the second half of 2017. Fit-for-purpose also implies this mapping is done at the appropriate detail and scale, ranging from detailed where needed, like in urban areas, to more general in remote rural parts of Mozambique. It is based on (where available) open and free satellite imagery and published using the existing Geoportal, while investigating the use of open platforms like Openstreetmap or ArcGIS Online.

The product specifications and quality assurance and control procedures of the mapping project of South Korea will be continued to avoid multiple and non-uniform approaches. The production schedule of topographic maps will be in alignment with the information needs of CRMO (DINAT and DINOTER), but also other stakeholders like Telecom, Ministry of Transport, Ministry of Agriculture, INE, etc. CRMO (DINOTER) will start nationwide planning with an overview of zoning of the existing situation with indications of the desired spatial developments by the local communities for housing, agriculture, infrastructure etc.

Another important aspect of this approach is the 'train the trainer' program, aiming at developing skilled and motivated trainers at CENACARTA, responsible for training and coaching of data

collection staff. This method will ensure that the expertise to train skilled staff is developed and stays within CENACARTA, this must keep the production staff at an average of 20 persons.

This fit-for-purpose starting point is also applied when developing a sustainable maintenance process for the topographic and remote sensing products and services. This includes the use of crowd sourced information, for instance on names of features; database of geographic names; other sources like DINAT (during land parcelling), INE (census), Ministry of Agriculture.

As soon as a spatial plan is available this plan can be used to enforce development of the land in alignment with the plan (themap with parcels, topography and zones). Zones are included as restrictions in the land information system. This means that enforcement of land development is not based on the individual DUAT but on spatial zones. Boundaries of zones are always parcel boundaries.

3.3 Cost calculations topographic mapping

During the data collection period of the first 5 years, until Mozambique is fully mapped, daily support on site at CENACARTA by skilled technical staff is needed to assist and guide the production process. It is suggested to have at least 1 officer available for support and further development of the different production processes at CENACARTA.

ICT costs are calculated on the below. Cost recovery may be desirable but difficult to achieve. Budgets may be needed as an alternative way of financing. The fact that topographic maps are required for spatial planning is relevant in this context – the topographic maps are needed for that purpose. Spatial planning contributes to enforcement of desired land use. This means a supervision on land development per DUAT is not needed anymore. With this in mind, topographic mapping can be included in the Cadastre Tax or Annual DUAT Subscription.

Cost calculations are based on the assumption that imagery will be available for free[3]. Cost calculations included training, management, geodetic network, topographic map production, etc.

4. Improvement of the land information management system (SIGIT) and ICT

4.1 As Is Situation ICT and SIGIT

The Mozambican's Land Information Management System (LIMS/SIGIT), an ISO 19152 Land Administration Domain Model (LADM) based system is from 2012. The system was built under the Millennium Challenge Corporation - MCC "Land Tenure Regularization" LTR program. The SIGIT architecture and design allowed to gauge security, scalability and sustainability. 10 provinces (originally 4) and 8 Municipalities together with DINAT agreed to develop the software in the context of the MCC project. SIGIT's unique purpose is maintenance of the spatial and legal datasets in land administration in Mozambique.

SIGIT is the core system for data processing in support to land administration in Mozambique. It runs on Oracle database. The geographical data are managed with ArcGIS from Esri, the geographical data can be accessed using Spatial data Engine from Esri. Apart from this there is a GeoPortal under development at the 'output side'.

'SIGIT Mobile' may be used for data acquisition in the field – in support to 'initial input' apart from regular maintenance.

SIGIT implemented into its workflows all land-related legislations, regulations and policies. It comprises all land administration processes from registration, to taxation, to expansion or reduction of area, to transmission of rights, to revocation or cancellation of rights. The Governance Model in place for ICT in general and for SIGIT specifically could be further developed, including more comprehensive Service Level Agreements operational between DINAT and its main software and service provider.

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[3] See for example: http://fortune.com/2017/03/20/satellites-bill-gates-buffett-omidyar/

Organisations with responsibilities in land administration usually publish and interchange their datasets. This is not yet the case in Mozambique. Publication is only possible if the data model (or an interface of the data model) is known and understood in detail by experts and professionals. Publication of the data model would allow data interoperability and data usage by governments, companies and citizens. At this moment exchange of data with other organisations still has t be agreed and organised.

4.2 To Be Situation ICT and SIGIT

ICT is under the responsibility of the autonomous CRMO. It is expected that there will be strategic relations with other ICT departments and ministries – building infrastructure for information supply. This requires extra budgets.

A Governance Model will be implemented. Focus is improvement of the ICT performance and effecting Service Level Agreement (SLAs) with suppliers. Availability of (certified) ICT capacity within the land sector is crucial and must organised by the government of Mozambique – where needed and possible in cooperation with donors. This is only possible if competitive salaries for ICT staff within DINAT and within the main suppliers organisation are guaranteed.

SIGIT is being used for workflows in support of initial production and maintenance of DUATs in land administration.

SIGIT will be available for all provinces and municipalities that are willing to apply the software. The LADM Country Profile for Mozambique is published on the DINAT website as a basis and starting point to offer such cloud based interoperability.

An ICT strategy is available defining the components of the core software of DINAT that can be outsourced to partners. The proposed strategy is that SIGIT can be used nationwide for land administration purposes in urban and rural areas. The data- model is published for purposes of interoperability. DINAT has knowledge on the data model at detailed level and access to the database. One issue of attention in this strategy is the license structure.

Extra capacity is available for ICT support within DINAT. DINAT could find ways allowing the organization to guarantee that educated experts do not disappear to other organisations (…).

A new workflow is developed (with links to a minimal set of attributes) and the Geo Portal is further developed. Risk management and quality management are under a ICT Government Model.

4.3 Cost calculations ICT

This includes costs and salaries for more experts in ICT. Datacentre costs and licensing.

5. Institutional development, infrastructure and capacity building

CRMO is an Autonomous Organisation under the Ministry of Land, Environment and Rural Development. This ensures a holistic attitude towards political, technical, human resource and other issues, with several advantages:

- A stronger and (more) autonomous position in government and towards private and academic sector. This is especially of high value when developing the business model, based on cost recovery principles.
- The mentioned existing organizations suffer from a lack of skilled personnel. Instead of each organization dealing with the same capacity problems, an integrated solution can be developed towards e.g. in house training programs, dedicated curricula at schools and colleges, internships, etc.
- More autonomy means more freedom to set up a competitive salary structure, based on the scarcity of skilled personnel (as far as possible).
- IT infrastructure costs and needs can be shared; less redundancy in purchase and maintenance of servers, databases, PCs, etc.
- Stronger representation towards stakeholders and customers

5.1 As Is Situation

Compared to other countries the available capacity in the land sector in Mozambique is very low. A substantial number of extra and competent staff is required. The question is if the availability of extra and components staff can be organised in short term. This is related to issues as nationwide quality standards (for urban areas included), network and services via cloud, security, continuity of ICT Infrastructure, partnerships, strategic partnerships and development of human capacity in the land sector. Management and project management are the main challenges.

5.2 To be Situation

The CRMO provides land administration, topographic and spatial planning products and services nationwide. This includes DUAT provision and maintenance (incl. communities and support to conflict resolution), SDI (platform for geo information), spatial plans (based on zoning of the existing situation and indications of desired developments based on participatory approaches combined with risk mapping).

DINAT will set nationwide standards by means of national coordination on the developments for creating a playing ground for development of standards (for Fit-For-Purpose Land Administration, implementation of the Land Administration Domain Model, OGC and ISO standards), location based services, the building up of national location related datasets, for instance on buildings, addresses, rights and persons.

Information exchange programmes are developed related to land and buildings among a first important group of institutions. Being the Ministry of Finance (Taxation Office), National Bureau of Statistics, Provincial Service Authorities and District Services (in which district the data have been collected), the Registo Predial and DINAT. Registro Predial and DINAT, unified in the CRMO, are the backbone.

The CRMO is an autonomous organisation operating on cost recovery basis – at least for land administration. Budgets are needed for topographic mapping and spatial planning activities. Income is mainly generated from DUAT production and provision, DUAT maintenance, land information provision (taxation, international investments, tourism, mortgage industry). Sharing knowledge and experience in digital land administration with other countries is a prerequisite. The CRMO has the legal power to sign DUATs and to register ownership of buildings. Spatial Zones will be included in the land administration and can be enforced.

5.3 Organisation

The Organisation is proposed to have a Director General and 5 directors with their own mandates in Cadastre, Registry, Topography, Spatial Planning Preparations and Publication and ICT. Staff groups under the DG are Finance, Personnel and Organisation and Planning and Monitoring - Resource management. There is a management level within each province. The third level is the local level and this is situated independent from the administrative structure. The availability and location is purely based on demand of citizens and users.

It is a single and strong organisation close to the people and close to the users. Users may be integrated into the organisation by a User Council. The CRMO has its own Bank Account – this allows operation as a business – as far as possible separated from the governmental budget and planning system. Its salary structure allows competition with the market.

CRMO is functioning at central, provincial and local levels and may be one or two levels deeper. This is needed to establish minimal distance between citizens and the land sector in the maintenance phase. Topographic mapping within CENACARTA will be included. Note: local level is not necessarily the same as district level.

Capacity building is crucial. This concerns strengthening the institutional capabilities of DINAT, such as: technical, in fields of management control (risk management, auditing, quality management, information management, performance measurement planning and control and

management information) and finance (transparency, accountability, participation), in fields of human (training, re-skilling, new skills and attitudes) and other resources management (ICT, buildings, cars). In customer orientation, image building, cooperation and communication and in strategy and business planning and control.

Capacity building is proposed to include at least 250 persons for data acquisition – legal and spatial – and later also 250 for maintenance and 100 managers.

Education abroad may need to be organised for 5 logistic managers, 10 managers for cadastre and registry and 5 for Geodesy, Cartography and Spatial Planning. 10 ICT experts will be educated abroad, and of course outsourcing of activities is an alternative. In total 620 persons are proposed to be educated until 2025. This process will continue after 2025.

Employees from the existing organisations may be involved in the capacity building programme – competence must be proven – in an land administration organisation where cost recovery and result orientation prevails there is no option for situations of well paid jobs without bringing performance.

5.4 Planning and Monitoring - Resource management

Annually, 1 M DUATs are produced between 2020 and 2025. From the moment of preparation of local reviews, a local office in involved in the process. 50 Offices need to be opened during 5 years – with 50 managers and 250 land administration officers educated at INFATEC, together with the education institute for Spatial Planning.

Those offices are at local level and at provincial level.
– Officers in local offices can bring support to data maintenance (incl spatial zones)
– Offices are opened immediately after the data have been collected.
– Many updates can be expected as a consequence of spatial planning.

5.5 Costs for maintenance

50 local offices must be opened. The establishment includes ICT, Power security etc), customer interface via the web and at all offices; 'one-stop-shop'. A one stop shop may be organized by the communities.

The fees for the production and maintenance of DUAT's should be brought into discussion. This will generate revenues. At some point costs could be in balance with the revenues.

Possible revenues are:
  – DUATs could be provided at a compensation by the citizens of USD 15 – 25
  – Maintenance fees
  – Taxation
  – Mortgage information provision could generate 1M annually.

Note: users of the geodetic infrastructure will not pay for the service. It is a service for Free. Users of topographic maps will not pay for the use of the maps (this is part of the Spatial Data Infrastructure). Availability of the spatial infrastructure has impact on economic development, innovations, car navigation, tourism, etc. From this perspective budgets can be reserved. The cost recovery model should be developed together with the CRMO strategic Plan

6. Policy and Legal Framework, Risks

The implementation programme is based on the idea that land administration is not just a project, but a business. In an autonomous organisation revenues can be generated resulting in cost recovery. This means that the organisation operates on distance from the ministries and the government. Assessment is based on performance and delivery of agreed numbers of DUATs, and maintenance of those DUATs. The organisation is not completely autonomous – some of the employees have authority to represent the government as authority, signing provided DUATs. This principle must be accepted and is as such a risk.

If employees (at all levels) are not competent, the new organisation will not be successful. For this reason, a capacity building programme is included for 620 persons. Those people will be in the new organisation. It means that persons must proof that they are competent. This may not be in alignment with social policies of the government. There is a risk that this approach is not accepted.

The Government of Mozambique is exclusive user of the SIGIT software. SIGIT will be used in support to the data maintenance and management of the National Land Administration Information System.

Reduction of attributes and simplification of workflows is proposed. This means that existing regulations and laws need to be changed. There is a risk that this is not agreed with. Proper communication on the benefits is of vital importance.

The proposal is to ask compensation in money from the citizens for DUAT provision. This concept must be accepted at political level. Citizens must pay for most of the governmental services – but not for DUATs – because land use in good faith is legally protected. For this reason, there may be opposition to the concept of cost recovery. It may be proposed to allow buying and selling of DUATs and in this way, bring DUATs on the market. Condition in that case is that a spatial zone is defined. Developments at parcel level must be in alignment with the development options and restrictions as defined for the zone. The zones are included in the National Cadastre.

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IMPLEMENTATION STRATEGY FOR LAND ADMINISTRATION IN MOZAMBIQUE

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Abstract

Land administration in Mozambique needs to become less bureaucratic, simpler, cheaper and more transparent. Design and implementation of traditional approaches is so time consuming that land laws are to be adapted to provide for simpler procedures. Delivery of results (maps, DUATs[1], spatial plans) requires unconventional approaches, both conceptual and technological.

This paper proposes an implementation mechanism for the Land Sector Strategic Plan in Mozambique. A clear priority is identified in this proposal: DUAT production for 5 million parcels before 2025 combined with an land administration organisation where maintenance can be performed. This allows for the future development and introduction of a more comprehensive land governance[2] in the related areas.

Land administration is considered as a business that operates within legal frameworks. Topographic mapping and land use planning should be included in this business approach.

It is considered that the implementation of the Land Sector Strategic Plan of Mozambique can be achieved by one unique, single organisation for land administration and topographic mapping operating at different levels of administration.

Key Words: Land Administration, implementation, Mozambique

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[1] DUAT, from the Portuguese Direito de Uso e Aproveitamento dos Terras—'right of use and benefit of land.'

[2] Land governance systems have two important aspects: administration and management. Land administration (*legislative package, land valuation, collection of fees, taxes, rights, cadaster, regularization, etc.*) is part of the infrastructure that supports good land management (*form of land/use, planning, land-use planning, conservation, construction planning, regulation, implementation, resettlement, development, etc.*).

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1. Introduction

Land administration in Mozambique needs to become less bureaucratic, simpler, cheaper and more transparent. Design and implementation of traditional approaches is so time consuming that land laws are to be adapted to provide for simpler procedures. Delivery of results (maps, DUATs, spatial plans) requires unconventional approaches, both conceptual and technological.

This paper proposes an implementation mechanism for the Land Sector Strategic Plan in Mozambique. A clear priority is identified in this proposal: DUAT production for 5 million parcels before 2025 combined with an land administration organisation where maintenance can be performed. This allows for the future development and introduction of a more comprehensive land governance1 in the related areas.

Sound policy and decision making with respect to the use and planning of land in Mozambique is based on a geographic knowledge of the national territory. Reliable geo-spatial information is essential for a well-functioning government, private sector and society in general. To achieve reliable geo-spatial information, topographic data should be that widely accessible at different scales, and integrated in one platform with cadastral data and land use data.

In this context, land administration is considered as a business that operates within legal frameworks. This business approach would imply cost recovery where possible and transparency in execution of the business. Topographic mapping and land use planning should be included in this business approach. However, additional budget may be needed in these areas – because cost recovery may be difficult to achieve here.

Implementation of the Land Sector Strategic Plan can be achieved by one unique, single and autonomous organisation for land administration and topographic mapping. This organization has to be developed. The National Directorate of Land (DINAT) (under the Ministry of Land, Environment and Rural Development) and the Provincial Geography and Cadastre Services (SPGC) are proposed to be brought under this organisation. Inclusion of the Land Registration (under the Ministry of Justice, Constitutional and Religious Affairs) into this organsation may be

considered. It is advised to develop this autonomous organisation further with the National Centre for Cartography and Remote Sensing (CENACARTA) and the NationalDirectorate of LandPlanning and Resettlement (DINOTER). In this way, a nationwide Cadastre, Land Registry and Mapping Organisation (CRMO) appears.

The main objective of a CRMO is to provide services and customer satisfaction. In this way, a CRMO will be widely accepted amongst its users as the authority providing tenure security and as a partner in business providing land and spatial information from a national platform. The CRMO will be a user- and demand driven organisation. A CRMO User Community will consist representatives of planners and developers of cities, experts in transportation and logistics, agricultural planners and monitoring experts, experts in statistics, mortgage providers, valuers and tax collectors.

For the production and for the future maintenance of 5 million DUATs (immediately followed by a programme for 10 million DUATs), resources and financing is needed. Financing based on a cost recovery approach is proposed – at least for land administration. This could be based on an annual 'land administration' or 'cadastral' fee for DUAT holders.

Land-administration organisations in Mozambique put much effort in determining, registering and disseminating information on the use of land and ownership of buildings. The large amount of data involved, is subject to many changes. This data needs to be kept up to date and must be accessible for retrieval. Consequently, operations can only be carried out efficiently and effectively with ICT support. However, the question raises on what is the appropriate approach to organisational objectives in relation to the opportunities offered by ICT. A strategic alignment between business and ICT is needed.

In this implementation mechanism, the following key elements are considered for the reform of the land sector:
- Land cadastre
- Cartography, land use planning and resettlement
- Improvement of the land information management system (SIGIT)

- Institutional development, infrastructure and training
- The Legal Policy Framework

These elements will be discussed in this paper.

2. Land Cadastre

2.1 As is situation

In the past two decades, appropriate legislation was enacted to protect the poor and the communities. However, most land, more than 90%, is still used under unregistered good-faith occupations and customary tenure arrangements. This limits equality in access and security of land tenure. Especially, the country's ability to make appropriate reforms is weakened due to poor information on land use and land rights.

At this moment, the organisation for the land cadastre looks like an archipelago. Mandates and responsibilities are widely distributed. The Land Administration organisation is designed for paper based approaches – not at all for digital approaches with computerised workflows formaintenance or for provision of platforms and services.

Land administration is not very well accessible for citizens. Especially in rural areas, offices are located far away. This constellation does not allow a scalable approach in data acquisition for DUAT production within the defined time horizon of 2025. Inter-organisational workflows have a huge impact on the performance of the data collection and of the DUAT provision. The existing of workflow needs to be simplified substantially.

2.2 To Be situation

The Land Cadastre and the Property Register is under the responsibility of the CRMO. The Land Cadastre and the Property Register establish the Land Administration – where possible operating under cost recovery. This requires some level autonomy for the CRMO (which is possible to organize in Mozambique).

Main priority for the CRMO is having 5 million DUATs available in 2025 in a land administration organisation where maintenance of the land administration can be performed. Maintenance is needed because the relations between people and land are dynamic. Production and successive maintenance of DUATs will be done in a well accessible National Land Administration database with land data and services for maintenance and updating. Then there will be follow up for 10 million more parcels between 2026 and 2030. Tenure security is relevant for investments and developments based on planning approaches. The CRMO is expected to operate all its land information digitally. Continuity in the availability of a land management information system is crucial. Certified capacity is only available in case of competitive salaries of staff – especially for the ICT support. Per the strategy plan for the Land Sector there is a need for reform and capacity building of the land administration and management system. Per the plan this is a multidimensional task requiring a systematic approach and the concentration of resources at the most strategic entry points – combined with the establishment of an autonomous institutional framework, with human, material, and financial resources. As well as a physical and communications infrastructure that is appropriate to the size and complexity of the Land Sector at national level. New methodologies and technologies are needed to make the DUAT production and maintenance sustainable, expeditious, accessible and relying on simplified procedures.

Making a complete overview for 5million parcels of all existing people-land relationships, as occupancy, informal and customary land use is the 'starting point' in the implementation of land administration. Creating an overview of the existing land tenure situation includes overlapping claims on land use, disputes and conflicts. It is crucial to get an overview of spatial units which are under dispute on a map. In this way, dispute resolution can be organised. This overview of disputes may include conflicting DUAT assignments based on decisions from different governmental levels.

The initial data acquisition will be done in the field and in the villages with participation of all land users. The government – represented by CRMO officers – will be present in the field. For this reason, CRMO should be organised as a strong, autonomous and single organisation with a clear mandate and well developed functional command lines, focussing on customer orientation and

product and service delivery. The organisation should operate at national, provincial and local level. Local offices should be located at places that meet customers demand. There is no need to link to administrative division to location of local offices.

The CRMO should operate on cost recovery basis – this implies that costs of producing the DUATs need to be paid by the citizens. Recording millions of people-land relationships will provide a stimulus for a growing land market. Maintenance costs can be compensated from an annual fee. Costs will be at the lowest possible level – by designing a minimal viable product without unnecessary attributes and process steps.

Note: a similar approach (paper based) as described below was tested earlier by DINAT. The full digital approach, for example with SIGIT Mobile or other mobile applications for land administration, requires simplified workflows with minimal numbers of attributes. This requires testing and piloting.

2.3 Methodology for DUAT data acquisition: digital approach

A digital, App based, methodology will be used for initial data acquisition: cheap, fast and good enough. Fieldwork will bring a complete overview of all existing people-land relationships in the selected areas of data acquisition. Area selection, transport, awareness raising, field work, local review, data handling and publication needs to be organised. This work can be outsourced. Logistic experiences from within National Statistics in the 2017 Enumeration need to be re-used in the organisation of fieldwork. Formal co-operation is needed with this organisation for this purpose. In all cases government officials need to be involved in all field work – to sign DUATs and for decision making conflict resolution in co management with local and traditional authorities. Co-management means that a trained governmental representative will solve conflicts (where possible) together with local authorities. If conflicts and disputes cannot be solved a next step will be the court.

The local authorities are informed in advance and are involved in the organisation of awareness sessions. Fixed programmes and promotion materials are being used. Projectors need to be available.

Transportation is expected to be the main cost component in DUAT production. Calculations are based on field transport with 7 person cars: 5 teams – each team consists out of 1 person –, 1 government representative and 1 driver.

Land users are invited during the fieldwork to walk the perimeters of their parcels with a GPS antenna. They point the vertex points of the boundaries themselves. A grass root surveyor records the observations with a mobile application. This application comes with the satellite image of the area2. Data collection is done in an integrated way: the perimeter is stored together with a photo of the users and a photo of the id of each user.

Women's access to land is the key issue here. Shares of women in land use will be included in the inventory. This is more relevant then high geometric accuracy! If someone already has a DUAT, a photo of that DUAT will be taken. Community involvement is the basis for success; the very nature of cadastral survey requires the participation of neighbours, family members, etcetera. Important to note; Collected boundary data are also superimposed on the satellite imagery. This allows easy interpretation by the local people. Many of the boundaries in rural areas in Mozambique are visual boundaries and thus easy to identify in the field and on the imagery. Those visual boundaries are identified in the field and then 'drawn' and/or 'digitally drawn (with the App)' on top of satellite imagery. It is important to get overview of the plots with a highly reliable link to the type of right and its right-holders – male and female. Placing beacons and producing highly accurate surveys may be done later during the maintenance phase if needed.

There will be a local review on the collected overview of land use by the community. This review will be organized by the data collectors together with authorities from a (newly established) local CRMO office – if possible supported by cloud based services; this depends on the availability of telecom. The local CRMO office head signs the DUATs – with stamps after payment by the DUAT

holder. This brings validity – and from this moment on a Cadastre tax or annual subscription must be paid.

A cloud service brings the advantage that data is managed from one place: all data are stored into a central database. During field work, disputes are mapped for resolution. A zoning overview of the existing situation in land use must be prepared in the field by governmental officials. Among other things this overview will represent housing, agriculture, roads, services, etc. Where possible topographic maps will be used for this purpose.

After field data collection, the data need to be checked on completeness and need to be prepared for DUAT production. Since perimeters have been walked for all parcels, there are two observations for each boundary. The average lacation can then be calculated, if observations are within sub metre tolerances. Overlapping claims in land use or overlapping DUAT assignments will be visualised on a conflict map. The conflict map is a 'what to do map' for people involved in conflict resolution. Conflicts need to be solved – based on conventional procedures. A first step may be finding agreement based on mediation in the field by government representatives in co-management with local authorities.

After this process, the DUATs can be published. A newly established local office of CRMO is involved in this process of publication. This is important because the process of DUAT production and conflict resolution run in parallel.

Note: it can be considered to leave a paper image with the boundaries included can be left with the people. This needs further discussions – this option is not yet included here.

2.4 Maintenance

When parcel data are available, a maintenance organisation needs to be in place for that area. This means a local office is established and functioning before the first review in an area of data collection is organised. The review will be organised by the data collector team together with authorities from the local CRMO office and in co-management with local leaders.

All DUAT assignments will be managed by the CRMO. Conflicts between assignments from different 'levels' in the hierarchy of the government will be avoided in the future due to the available digital land information.

2.5 ICT Support

Computerising data acquisition is based on a mobile application, for instance the Collector App from providers as Esri, or others like EXI. This allows for very efficient data collection. The App will be used in combination with a GPS device for sub-metre accuracy, via a Bluetooth connection. The interface between the GPS device and the Collector App can be managed from a smartphone or tablet.

Lightweight devices in the field are very efficient to use in Mozambique. In addition, the tools and technologies to develop the application are known inMozambique. The GPS device requires a correction signal for correction of atmospheric distortions of the GPS signals. Sub-meter accuracy is sufficient. High geometric accuracy is not needed in this stage – in case such signal is available from a working Continuous Operating Reference Station it can be used of course.

The use of cloud services may mean data are stored outside the country. Arrangements may be needed to avoid this.

2.6 Cost Calculations Land Cadastre

Cost calculations include training and education for the data collectors, transport, salaries, daily allowance for the data collectors, devices (mobile, gps antenna), awareness raising, data collection, data handling. Costs are estimated to be around 15 – 25 USD per signed and distributed DUAT.

The calculated 15 – 25 USD per signed DUAT is based on the assumption that imagery is available. Fees for the production and maintenance of DUAT's should be brought into discussion. This will generate revenues. At some point costs could be in balance with the revenues

Action points for DINAT:

- Organise political support for integration to a single and unique autonomous organization at central, provincial level and local level
- Identify the locations of offices for maintenance. Locations can be based on distance criteria
- density of land information. There is no need to align to administrative division of the country
- Improve and densify the geodetic reference network, as a solid base for reliable topographic mapping, but also any other field survey work (land cadastre and land registry, agriculture, statistics).

3. Cartography, land use planning and resettlement

3.1 As Is Situation

In Mozambique, the National Centre for Cartography and Remote Sensing – CENACARTA – is the responsible organization for the production and maintenance of topographic maps, and remote sensing products and services, satellite and aerial imagery and the spatial data infrastructure (SDI). Currently, a big part of the country's topographic information is more than 40 years old. In some areas in the north of Mozambique, topographic information is not even available. Currently, both production and maintenance of these products and services suffer from a lack of resources and skilled personnel.

In 2015, a project led by South-Korea, started to map the Zambezi Valley at a scale 1:25,000, covering around 220,000 km2 of terrain. This project will end in 2017, delivering detailed topographic information of roughly 25% of the territory of Mozambique.

To produce a topographic map of Mozambique, the production capacity of CENACARTA must be enlarged extensively. A production plan for topographic mapping need to be set up. This production plan can be (partly) based on continuation of the experiences of the mapping project of South Korea.

Land use planning is institutionalised but not implemented in practise. There is a need for topographic maps as base materials for design and implementation of spatial plans. There are ideas for participatory planning – but not yet implemented.

3.2 To Be Situation

Cartography (topographic mapping), land use planning and resettlement under the responsibility of the autonomous CRMO. Cartography (topographic mapping), land use planning and resettlement are operating as a normal business – as far as possible under cost recovery – it is expected that budgets are needed for topographic mapping and spatial planning activities.

Integration of CENACARTA with other organizations like DINAT for land administration and DINOTER for land planning and resettlement, in an autonomous 'Land' organization; see chapter 5. Main goal is to realise a country wide availability of reliable topographic information in 5 years' time, starting by training courses in the second half of 2017. Fit-for-purpose also implies this mapping is done at the appropriate detail and scale, ranging from detailed where needed, like in urban areas, to more general in remote rural parts of Mozambique. It is based on (where available) open and free satellite imagery and published using the existing Geoportal, while investigating the use of open platforms like Openstreetmap or ArcGIS Online.

The product specifications and quality assurance and control procedures of the mapping project of South Korea will be continued to avoid multiple and non-uniform approaches. The production schedule of topographic maps will be in alignment with the information needs of CRMO (DINAT and DINOTER), but also other stakeholders like Telecom, Ministry of Transport, Ministry of Agriculture, INE, etc. CRMO (DINOTER) will start nationwide planning with an overview of zoning of the existing situation with indications of the desired spatial developments by the local communities for housing, agriculture, infrastructure etc.

Another important aspect of this approach is the 'train the trainer' program, aiming at developing skilled and motivated trainers at CENACARTA, responsible for training and coaching of data

collection staff. This method will ensure that the expertise to train skilled staff is developed and stays within CENACARTA, this must keep the production staff at an average of 20 persons.

This fit-for-purpose starting point is also applied when developing a sustainable maintenance process for the topographic and remote sensing products and services. This includes the use of crowd sourced information, for instance on names of features; database of geographic names; other sources like DINAT (during land parcelling), INE (census), Ministry of Agriculture.

As soon as a spatial plan is available this plan can be used to enforce development of the land in alignment with the plan (themap with parcels, topography and zones). Zones are included as restrictions in the land information system. This means that enforcement of land development is not based on the individual DUAT but on spatial zones. Boundaries of zones are always parcel boundaries.

3.3 Cost calculations topographic mapping

During the data collection period of the first 5 years, until Mozambique is fully mapped, daily support on site at CENACARTA by skilled technical staff is needed to assist and guide the production process. It is suggested to have at least 1 officer available for support and further development of the different production processes at CENACARTA.

ICT costs are calculated on the below. Cost recovery may be desirable but difficult to achieve. Budgets may be needed as an alternative way of financing. The fact that topographic maps are required for spatial planning is relevant in this context – the topographic maps are needed for that purpose. Spatial planning contributes to enforcement of desired land use. This means a supervision on land development per DUAT is not needed anymore. With this in mind, topographic mapping can be included in the Cadastre Tax or Annual DUAT Subscription.

Cost calculations are based on the assumption that imagery will be available for free[3]. Cost calculations included training, management, geodetic network, topographic map production, etc.

4. Improvement of the land information management system (SIGIT) and ICT

4.1 As Is Situation ICT and SIGIT

The Mozambican's Land Information Management System (LIMS/SIGIT), an ISO 19152 Land Administration Domain Model (LADM) based system is from 2012. The system was built under the Millennium Challenge Corporation - MCC "Land Tenure Regularization" LTR program. The SIGIT architecture and design allowed to gauge security, scalability and sustainability. 10 provinces (originally 4) and 8 Municipalities together with DINAT agreed to develop the software in the context of the MCC project. SIGIT's unique purpose is maintenance of the spatial and legal datasets in land administration in Mozambique.

SIGIT is the core system for data processing in support to land administration in Mozambique. It runs on Oracle database. The geographical data are managed with ArcGIS from Esri, the geographical data can be accessed using Spatial data Engine from Esri. Apart from this there is a GeoPortal under development at the 'output side'.

'SIGIT Mobile' may be used for data acquisition in the field – in support to 'initial input' apart from regular maintenance.

SIGIT implemented into its workflows all land-related legislations, regulations and policies. It comprises all land administration processes from registration, to taxation, to expansion or reduction of area, to transmission of rights, to revocation or cancellation of rights. The Governance Model in place for ICT in general and for SIGIT specifically could be further developed, including more comprehensive Service Level Agreements operational between DINAT and its main software and service provider.

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[3] See for example: http://fortune.com/2017/03/20/satellites-bill-gates-buffett-omidyar/

Organisations with responsibilities in land administration usually publish and interchange their datasets. This is not yet the case in Mozambique. Publication is only possible if the data model (or an interface of the data model) is known and understood in detail by experts and professionals. Publication of the data model would allow data interoperability and data usage by governments, companies and citizens. At this moment exchange of data with other organisations still has t be agreed and organised.

4.2 To Be Situation ICT and SIGIT

ICT is under the responsibility of the autonomous CRMO. It is expected that there will be strategic relations with other ICT departments and ministries – building infrastructure for information supply. This requires extra budgets.

A Governance Model will be implemented. Focus is improvement of the ICT performance and effecting Service Level Agreement (SLAs) with suppliers. Availability of (certified) ICT capacity within the land sector is crucial and must organised by the government of Mozambique – where needed and possible in cooperation with donors. This is only possible if competitive salaries for ICT staff within DINAT and within the main suppliers organisation are guaranteed.

SIGIT is being used for workflows in support of initial production and maintenance of DUATs in land administration.

SIGIT will be available for all provinces and municipalities that are willing to apply the software. The LADM Country Profile for Mozambique is published on the DINAT website as a basis and starting point to offer such cloud based interoperability.

An ICT strategy is available defining the components of the core software of DINAT that can be outsourced to partners. The proposed strategy is that SIGIT can be used nationwide for land administration purposes in urban and rural areas. The data- model is published for purposes of interoperability. DINAT has knowledge on the data model at detailed level and access to the database. One issue of attention in this strategy is the license structure.

Extra capacity is available for ICT support within DINAT. DINAT could find ways allowing the organization to guarantee that educated experts do not disappear to other organisations (…).

A new workflow is developed (with links to a minimal set of attributes) and the Geo Portal is further developed. Risk management and quality management are under a ICT Government Model.

4.3 Cost calculations ICT

This includes costs and salaries for more experts in ICT. Datacentre costs and licensing.

5. Institutional development, infrastructure and capacity building

CRMO is an Autonomous Organisation under the Ministry of Land, Environment and Rural Development. This ensures a holistic attitude towards political, technical, human resource and other issues, with several advantages:

- A stronger and (more) autonomous position in government and towards private and academic sector. This is especially of high value when developing the business model, based on cost recovery principles.
- The mentioned existing organizations suffer from a lack of skilled personnel. Instead of each organization dealing with the same capacity problems, an integrated solution can be developed towards e.g. in house training programs, dedicated curricula at schools and colleges, internships, etc.
- More autonomy means more freedom to set up a competitive salary structure, based on the scarcity of skilled personnel (as far as possible).
- IT infrastructure costs and needs can be shared; less redundancy in purchase and maintenance of servers, databases, PCs, etc.
- Stronger representation towards stakeholders and customers

5.1 As Is Situation

Compared to other countries the available capacity in the land sector in Mozambique is very low. A substantial number of extra and competent staff is required. The question is if the availability of extra and components staff can be organised in short term. This is related to issues as nationwide quality standards (for urban areas included), network and services via cloud, security, continuity of ICT Infrastructure, partnerships, strategic partnerships and development of human capacity in the land sector. Management and project management are the main challenges.

5.2 To be Situation

The CRMO provides land administration, topographic and spatial planning products and services nationwide. This includes DUAT provision and maintenance (incl. communities and support to conflict resolution), SDI (platform for geo information), spatial plans (based on zoning of the existing situation and indications of desired developments based on participatory approaches combined with risk mapping).

DINAT will set nationwide standards by means of national coordination on the developments for creating a playing ground for development of standards (for Fit-For-Purpose Land Administration, implementation of the Land Administration Domain Model, OGC and ISO standards), location based services, the building up of national location related datasets, for instance on buildings, addresses, rights and persons.

Information exchange programmes are developed related to land and buildings among a first important group of institutions. Being the Ministry of Finance (Taxation Office), National Bureau of Statistics, Provincial Service Authorities and District Services (in which district the data have been collected), the Registo Predial and DINAT. Registro Predial and DINAT, unified in the CRMO, are the backbone.

The CRMO is an autonomous organisation operating on cost recovery basis – at least for land administration. Budgets are needed for topographic mapping and spatial planning activities. Income is mainly generated from DUAT production and provision, DUAT maintenance, land information provision (taxation, international investments, tourism, mortgage industry). Sharing knowledge and experience in digital land administration with other countries is a prerequisite. The CRMO has the legal power to sign DUATs and to register ownership of buildings. Spatial Zones will be included in the land administration and can be enforced.

5.3 Organisation

The Organisation is proposed to have a Director General and 5 directors with their own mandates in Cadastre, Registry, Topography, Spatial Planning Preparations and Publication and ICT. Staff groups under the DG are Finance, Personnel and Organisation and Planning and Monitoring - Resource management. There is a management level within each province. The third level is the local level and this is situated independent from the administrative structure. The availability and location is purely based on demand of citizens and users.

It is a single and strong organisation close to the people and close to the users. Users may be integrated into the organisation by a User Council. The CRMO has its own Bank Account – this allows operation as a business – as far as possible separated from the governmental budget and planning system. Its salary structure allows competition with the market.

CRMO is functioning at central, provincial and local levels and may be one or two levels deeper. This is needed to establish minimal distance between citizens and the land sector in the maintenance phase. Topographic mapping within CENACARTA will be included. Note: local level is not necessarily the same as district level.

Capacity building is crucial. This concerns strengthening the institutional capabilities of DINAT, such as: technical, in fields of management control (risk management, auditing, quality management, information management, performance measurement planning and control and

management information) and finance (transparency, accountability, participation), in fields of human (training, re-skilling, new skills and attitudes) and other resources management (ICT, buildings, cars). In customer orientation, image building, cooperation and communication and in strategy and business planning and control.

Capacity building is proposed to include at least 250 persons for data acquisition – legal and spatial – and later also 250 for maintenance and 100 managers.

Education abroad may need to be organised for 5 logistic managers, 10 managers for cadastre and registry and 5 for Geodesy, Cartography and Spatial Planning. 10 ICT experts will be educated abroad, and of course outsourcing of activities is an alternative. In total 620 persons are proposed to be educated until 2025. This process will continue after 2025.

Employees from the existing organisations may be involved in the capacity building programme – competence must be proven – in an land administration organisation where cost recovery and result orientation prevails there is no option for situations of well paid jobs without bringing performance.

5.4 Planning and Monitoring - Resource management

Annually, 1 M DUATs are produced between 2020 and 2025. From the moment of preparation of local reviews, a local office in involved in the process. 50 Offices need to be opened during 5 years – with 50 managers and 250 land administration officers educated at INFATEC, together with the education institute for Spatial Planning.

Those offices are at local level and at provincial level.

- – Officers in local offices can bring support to data maintenance (incl spatial zones)
- – Offices are opened immediately after the data have been collected.
- – Many updates can be expected as a consequence of spatial planning.

5.5 Costs for maintenance

50 local offices must be opened. The establishment includes ICT, Power security etc), customer interface via the web and at all offices; 'one-stop-shop'. A one stop shop may be organized by the communities.

The fees for the production and maintenance of DUAT's should be brought into discussion. This will generate revenues. At some point costs could be in balance with the revenues.

Possible revenues are:
− DUATs could be provided at a compensation by the citizens of USD 15 – 25
− Maintenance fees
− Taxation
− Mortgage information provision could generate 1M annually.

Note: users of the geodetic infrastructure will not pay for the service. It is a service for Free. Users of topographic maps will not pay for the use of the maps (this is part of the Spatial Data Infrastructure). Availability of the spatial infrastructure has impact on economic development, innovations, car navigation, tourism, etc. From this perspective budgets can be reserved. The cost recovery model should be developed together with the CRMO strategic Plan

6. Policy and Legal Framework, Risks

The implementation programme is based on the idea that land administration is not just a project, but a business. In an autonomous organisation revenues can be generated resulting in cost recovery. This means that the organisation operates on distance from the ministries and the government. Assessment is based on performance and delivery of agreed numbers of DUATs, and maintenance of those DUATs. The organisation is not completely autonomous – some of the employees have authority to represent the government as authority, signing provided DUATs. This principle must be accepted and is as such a risk.

If employees (at all levels) are not competent, the new organisation will not be successful. For this reason, a capacity building programme is included for 620 persons. Those people will be in the new organisation. It means that persons must proof that they are competent. This may not be in alignment with social policies of the government. There is a risk that this approach is not accepted.

The Government of Mozambique is exclusive user of the SIGIT software. SIGIT will be used in support to the data maintenance and management of the National Land Administration Information System.

Reduction of attributes and simplification of workflows is proposed. This means that existing regulations and laws need to be changed. There is a risk that this is not agreed with. Proper communication on the benefits is of vital importance.

The proposal is to ask compensation in money from the citizens for DUAT provision. This concept must be accepted at political level. Citizens must pay for most of the governmental services – but not for DUATs – because land use in good faith is legally protected. For this reason, there may be opposition to the concept of cost recovery. It may be proposed to allow buying and selling of DUATs and in this way, bring DUATs on the market. Condition in that case is that a spatial zone is defined. Developments at parcel level must be in alignment with the development options and restrictions as defined for the zone. The zones are included in the National Cadastre.

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