

Developing a Land Registration System using a Compromise between the Implementation of International Standards and Adaptation to Local Circumstances: The Cambodian Experience

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SUMMARY

Innovations in Information Technology have greatly influenced the development of cadastral systems during the last few decades. Driven by user needs and increasing demands for accurate and up-to-date information, cadastral organizations in developed countries have modernized their registration systems making use of these new technologies. Organizations in developing countries are also increasingly looking at digital solutions for their land registration activities, but often lack the technical and financial resources to build a digital land registration system from scratch. A lot has been written about the development of a universal land registration model based on international standards that can serve as a base for the development of national registration systems. Building a system using a common model seems time and money saving, but would it be adequate in all situations? How can we use international standards while at the same time respecting the uniqueness of the local context and culture of land registration?

After all Cambodian land records were destroyed by the Khmer Rouge in the seventies, Cambodia had to start its land registration activities practically from scratch. With foreign support, pilot land registration projects were setup in 1997, and a new Land Law was adopted in 2001. In 2002, the Land Management and Administration Project (LMAP) was launched with one of its expected outputs being the systematic registration of 1 million titles before the end of the project. It was considered that a digital land registration system, rather than a paper based system, would be the most efficient way to realize this output.

One of the obstacles in the development of the system was the requirement that every land title must display a sentence in which the civil status of the owners and the category of property are clarified, rather than just the names of the owners. A digital system that ignored this requirement would not have been adopted easily in Cambodia. Another challenge was the Khmer language, which follows a different character set that is not supported by all software. Furthermore, the legal framework was still in development and the system would have to be flexible enough to allow for changes and additional functionalities later.

Now, in 2007, the digital system that was called CALIS (Cambodian Land Information System) is working in 11 provinces and contains over 800.000 registrations. Cadastral officers with little or no computer knowledge can enter the data in Khmer language and produce Land

Titles from the system. All paper documents are being scanned and linked to the system to facilitate storage and retrieval.

This paper demonstrates how the land registration system of Cambodia, while containing elements that are similar to land registration systems elsewhere, distinguishes itself from other systems with typical Cambodian ingredients.

សង្ខេប

ឯកសារនេះបង្ហាញពីអំពីដំណាក់កាលនៃការអភិវឌ្ឍន៍ការចុះបញ្ជីលក្ខណៈជាប្រព័ន្ធ ក្នុងកំឡុងពេលនោះប្រព័ន្ធចុះបញ្ជីលក្ខណៈ ជាប្រព័ន្ធអនុវត្តតាមប្រព័ន្ធអន្តរជាតិ ប៉ុន្តែចំណុចសំខាន់ៗត្រូវបានគេរៀបចំតាមរចនាសម្ព័ន្ធនៅប្រទេសកម្ពុជា។

សៀវភៅចុះ បញ្ជីទាំងអស់នៅប្រទេសកម្ពុជាត្រូវបានបំផ្លាញនៅពេលរបបខ្មែរក្រហមពីឆ្នាំ១៩៧៥ដល់ ឆ្នាំ១៩៧៩។ ដូច្នេះ ហើយបន្ទាប់ពីរបបខ្មែរក្រហមនេះប្រទេសកម្ពុជាចាប់ផ្តើមបង្កើតសៀវភៅចុះបញ្ជីដី ឆ្លើយតាមការគូសកត់ត្រាដោយដៃ។ ដោយមានការជួយឧបត្ថម្ភគាំទ្រពីបរទេស គំរោងចុះបញ្ជីដីស្តីពីសាកល្បងបានបង្កើតឡើងក្នុងឆ្នាំ ១៩៩៧ ហើយច្បាប់ភូមិបាល ថ្មីត្រូវបានយកមកប្រើក្នុងឆ្នាំ២០០១។ ក្នុងឆ្នាំ ២០០២ គំរោងរៀបចំដែនដី និង រដ្ឋបាលដីត្រូវបានចាប់ដំណើរការធ្វើការ ចុះបញ្ជីបែបលក្ខណៈជាប្រព័ន្ធ ហើយមានទិសដៅធ្វើឱ្យបានទិន្នផល ចំនួន ១ លានប័ណ្ណមុននឹងគំរោងត្រូវបញ្ចប់។ នៅពេល នេះ គេចាត់ទុកថា ការចុះបញ្ជីលក្ខណៈជាប្រព័ន្ធប្រើប្រព័ន្ធកុំព្យូទ័រ ជាវិធីដែលបង្ហាញទិន្នផលជាក់លាក់ និងល្អប្រសើរជាង ការចុះបញ្ជីដោយដៃ ។ ឧស្ម័នមួយនៅក្នុងការធ្វើឱ្យប្រព័ន្ធកុំព្យូទ័រនេះល្អប្រសើរគឺថាមិនគ្រប់គ្រាន់សរសេរតែឈ្មោះនៃកម្ម សិទ្ធិករនៅលើប័ណ្ណកម្ម- សិទ្ធិ។ តំរូវអោយរាល់ប័ណ្ណកម្មសិទ្ធិទាំងអស់ត្រូវធ្វើតាមរូបមន្ត ពិសេសដែរ ដែលនៅក្នុងមាន អាត្រានុកូលដ្ឋានរបស់ម្ចាស់ដី និងប្រភេទទ្រព្យ អោយបានច្បាស់ លាស់។ បើសិនបើប្រព័ន្ធកុំព្យូទ័រនេះមិនបានអនុញ្ញាត ឱ្យប្រើរូបមន្តនោះយ៉ាងត្រឹមត្រូវប្រហែល អាជ្ញាធរសុរិយោដីនៃប្រទេសកម្ពុជាមិនអាចប្រើវាទេ។ ករណីផ្សេងទៀតគឺ ភាសារខ្មែរដែលការ ខុសគ្នាពីតួអក្សរខ្មែរពិបាកដាក់បញ្ចូលជាមួយកម្មវិធីផ្សេងៗរបស់កុំព្យូទ័រ។ ម្យ៉ាងវិញទៀតច្បាប់ ទាក់ទងនឹងការងារនេះនៅតែបន្តកែប្រែ ដូច្នេះបានជាការចាំបាច់បង្កើតប្រព័ន្ធកុំព្យូទ័រមួយដែលអាចអនុញ្ញាតការផ្លាស់ប្តូរ និងការបន្ថែមនៅពេលអានាគត។ បច្ចុប្បន្ននេះ ក្នុងឆ្នាំ ២០០៧ ប្រព័ន្ធកុំព្យូទ័រ ដែលត្រូវបានគេហៅថា CALIS ('កាលីស' មានន័យ "ប្រព័ន្ធព័ត៌មានដីនៅកម្ពុជា") កំពុងដំណើរការ នៅ ១១ ខេត្ត ហើយក្នុងនោះចុះបញ្ជីបាន ៨០០.០០០ ក្បាលដី ។ មន្ត្រីសុរិយោដី ដែលមានចំណេះដឹងតិចតួច ឬគ្មានចំណេះដឹងផ្នែកកុំព្យូទ័រ អាចបញ្ចូលទិន្នន័យជាភាសាខ្មែរ និងជាអ្នកដែល អាចបោះពុម្ពប័ណ្ណកម្មសិទ្ធិបាន។ រាល់ឯកសារ ពាក់ព័ន្ធទាំងអស់ គឺថតបញ្ចូលក្នុងកុំព្យូទ័រភ្នាក់ងារទាក់ទងនឹងទិន្នន័យ ដើម្បីជួយសំរួលក្នុងការ ស្វែងរកនៅពេលក្រោយ ហើយមិនស៊ុកន្លែងច្រើនដូចឯកសារ។ ឯកសារនេះបង្ហាញពីការចុះ បញ្ជីនៅប្រទេសកម្ពុជាមានលក្ខណៈ ស្រដៀងគ្នានឹងប្រទេសដទៃ ក្នុងខណៈដែលប្រទេសនោះកំពុងតែប្រើប្រព័ន្ធចុះបញ្ជី កុំព្យូទ័រ តែមានលក្ខណៈប្លែក គ្នាខ្លះៗ ពីប្រទេសដទៃ ជាតួយ៉ាងដូចជារូបមន្តទាក់ទងការចុះបញ្ជី ។

Developing a Land Registration System using a Compromise between the Implementation of International Standards and Adaptation to Local Circumstances: The Cambodian Experience

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1. INTRODUCTION

“Foreigners don’t understand our civil status formulas” said Cambodian government officials when the Land Management and Administration Project (LMAP) project started in 2002. They referred to the requirement that every land title must display a sentence in which the civil status of the owners and the category of property are clarified, corresponding to the practice developed locally since 1989 when the reconstitution of a paper-based cadastre had been undertaken without international support. And indeed, the formula requirement was one of the first challenges to be overcome in the development of the Cambodian land registration system.

The multi-donor (Cambodia, Finland, Germany, World Bank) LMAP preparation team was quite clear in its requirements for the development of a land registration system in Cambodia. The LMAP Project Appraisal Document (PAD) envisioned the development of a sustainable, efficient, transparent and effective *modern* land registration system. 1 million land titles were expected to be issued by the Systematic Titling component of the project between 2002 and 2007. The PAD stated as key indicators for a well functioning system that “access to information in the registry is available online to government, financial institutions and individuals for a charge”; and “the registration of a land transaction in Phnom Penh must be completed within one day by year 4 of the project” (World Bank, 2002). Apparently, the planners of the project envisioned a land registration system that most developed countries are working towards; a cadastre such as described in FIG Cadastre 2014 (Kaufman and Steudler, 1998).

The Cambodian government however had its own requirements and expectations. Would the land registration through LMAP comply with the tradition of land registration in Cambodia? Would a digital system respect the cadastral regulations as set by the Ministry of Land Management, Urban Planning and Construction? At the start of LMAP, most senior cadastral officials were weary of using computers for land registration and often remarked that the Cambodian Land Law did not recognize a digital cadastre. The Land Register, according to the Land Law, must exist in 3 paper copies. Computers could be used as a tool for the printing of the List of Owners, maps and the Land Titles, but they could never hold the official Land Register.

Apart from requirements and expectations, there were other issues as well. All information in the Land Register is written in Khmer language, thus if any digital land registration system were developed for use in LMAP, it would have to support the Khmer character set. Further

more, the legal framework was still in development and a system would have to be flexible enough to allow for changes and additional functionalities later. Financial resources were limited; since the LMAP is financed out of a loan rather than a grant, the project prefers to use simple and cheap technology. Time was limited as well. Even though the development of the system was expected to take place over the whole duration of the project, systematic registration would commence within a few months after the start of the project. In 2002, the development of a Modern Land Registration System for Cambodia seemed almost like a mission impossible.

2. BACKGROUND

2.1 History of ownership and land registration in Cambodia

The Kingdom of Cambodia covers an estimated 18 million hectares, most of it lying in the floodplain of the Mekong River. Over three-fourths of the population of Cambodia directly depends on agriculture and allied activities for its livelihood. Land is therefore the single most important productive asset for this section of the population (Chan et al 2001).

The rights on land and other immovable property have changed dramatically in Cambodia over time. In ancient times, prior to the French protectorate, all land belonged to the King. However, people had the right to possess and cultivate the land. Once acquired, the possession right could be transferred by succession or will, but it could also be lost when the land was abandoned for a period of 3 years (EWMI, 2003).

During the French Protectorate period (1863-1953), the Civil Code of Cambodia was introduced, in which the provisions relating to property rights were borrowed from the French Civil Code. Since then, the King was no longer the owner of all the land, but the concept of “possession” when the land was cultivated, remained. Based on this Civil Code, a first attempt to establish a land register was made, but it was not implemented all over the country.

During the Democratic Kampuchea era, the Khmer Rouge (1975-1979), abolished private ownership, collectivized all land and destroyed all land records, including cadastral maps and titles. Following the end of the Vietnamese occupation (1979-1989), private property rights were re-introduced to Cambodia only in 1989 allowing farmers to claim possession rights of plots up to five hectares after five years of continuously cultivating fields. Land left vacant for more than three years reverted to state ownership. During most of this period, individual property rights were not recognized by law.

The 1992 Land Law re-introduced the private ownership of land. The Law also recognized possession and allowed ownership of land to be acquired through 5 years possession. Following the enactment of Law, a program was initiated calling for applications for land tenure certificates to confirm possession. More than 4 million applications were submitted, but by mid-2001 only 14% of them had been processed (Chan et al, 2001).

The 1993 Constitution changed Cambodia from a centrally controlled, regulated society to a free market-based democracy. The Land Law of 1992 was no longer consistent with the principles set out in the new constitution, and instead of amending the Law, a new Land Law was created in 2001. This new Land Law prescribed that 5 years peaceful and uncontested possession entitles directly to ownership without any prior authorization or documents. However, at the same time the Law prohibited any new possession of state land. The 2001 Law requires that Cadastral Index Maps be made of all properties in Cambodia and gives responsibility for creating these maps and the Land Register to the Ministry of Land Management, Urban Planning and Construction (MLMUPC).

2.2 Organization of the land registration in Cambodia

The land registration in Cambodia is presently conducted under the Land Management and Administration Project (LMAP) within the Cadastral Administration of the MLMUPC. From 1989-1994, the Land Titles Department was located within the Ministry of Agriculture. The provincial and district offices of the Department of Cadastre carried out the work and the provincial governor was the final authority for the issuing of land titles. In 1995, the Land Titles Department was shifted to the Council of Ministers. The final authority also shifted from the provincial governor to the director of the Land Titles Department (Chan et al, 2001). In 1998, the Land Titles Department was relocated to MLMUPC and is now called General Department of Cadastre and Geography (GDCG).

The multi-donor LMAP project has its origin on three pilot projects financed by the governments of Finland, Germany and France. Based on findings and positive results of these pilot projects, the Royal Government of Cambodia decided to commence a countrywide program to register ownership and issue land titles for the rural and urban population of Cambodia. For this purpose the Government contacted the World Bank and requested financing, in form of a soft loan, for a 5-year project. Governments of Finland and Germany act as co-financiers for the project. The LMAP consist of 5 components. The Government of Finland supports Technical Assistance to the third component, "Land Titling program and development of a modern land registration system", through the company FM-International Oy FINNMAP.

2.2.1 Systematic registration

Systematic registration is done on village by village basis. The process starts with the declaration of an adjudication area, after which an opening meeting is held to inform landowners about the registration procedure. Then, the land registration team visits every parcel; during this visit the parcel boundaries are demarcated in presence of the neighbors, while the owner information is recorded on the Parcel Form by adjudication officers. In the provincial cadastral office, the Cadastral Index Map is compiled and the List of Owners, which shows the owner information for each parcel that appears on the Cadastral Index Map, is prepared. (In LMAP practice, the demarcation officers mark the boundaries of the land parcels on a print-out of a digital orthophoto of the area (the "field sketch"). Where necessary, boundary turning points are collected by total station survey, stored in a pocket PC and marked on the field sketch. In the office, the boundary points and the field sketch supplied by

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the demarcation officers are used to digitize parcel boundaries (using digital orthophotos as backdrop), thus creating a digital geodatabase. The information from the Parcel Form is entered into an attribute database by data entry officers. Each parcel polygon in the geodatabase links to a parcel record in the attribute database through the UPRN or Unique Parcel Reference Number.)

When the processing of the parcel records of one village has been finalized, the Cadastral Index Map and List of Owners are printed for Public Display. The Public Display of registered data lasts for 30 days, during which the owner and neighbors have the right to verify the information and make objections. After the Public Display, the registered information is considered legally binding and a title is issued for each of the land parcels. All the parcel records of the village are printed in 3 copies to form 3 Land Books. One Land Book is sent to the GDCG for the national level Land Register, another one is sent to the District Cadastral Office, and the third stays in the provincial office.

2.2.2 Sporadic registration

Until the systematic registration of the whole country is completed, also sporadic registration takes place on demand of the owner. Up to now, the sporadic registration is a slow and relatively expensive process. The LMAP project has started preparations to implement sporadic registration through the same system as the systematic registration, but implementation has not yet started.

3. DEVELOPMENT OF THE CAMBODIAN LAND REGISTRATION SYSTEM

3.1 A Land Registration System in Cambodia: paper vs. digital

At first glance, land administration in Cambodia is quite similar to the situation in many other developing countries. In many cases, the Land Register covers only a small part of the country and systematic registration is needed to achieve full coverage. Also the contents of the Land Register are not very different from what is found in other countries. Lemmen and Van Oosterom (2006) state that the relationship between real estate object (e.g. land parcels) and persons (land owners) via rights is the foundation of every land administration. In Cambodia, the land parcel is the cadastral unit, and the register consists of cadastral maps and land books in which the rights and restrictions of owners are registered.

The Land Register shows, according to each parcel number of ownership, the name of owners and the means of identification of such land parcel, the description of the ownership, the size of land parcel, the easements and other charges that encumber it. Any subsequent changes in such data must be registered as soon as the Cadastral Administration is informed of such changes. Such register shall be maintained in three copies, one copy kept at the central Cadastral Administration Office and the other two copies kept at the provincial or municipal and Srok/Khan Cadastral Administration Offices. (Article 238 of the Land Law 2001)

The part of the Law that requires the Register to be maintained in three copies is generally interpreted to refer to paper copies. From the Cambodian point of view, it is understandable

that the Land Law requires the Register to consist of 3 copies. With the destruction of all the land records by the Khmer Rouge, including cadastral maps, the MLMUPC wants to avoid a similar situation. But the maintenance of three paper copies of the register will be impractical and logistically very difficult, especially since none of the three copies has been appointed as the master copy.

Even though the Land Register would officially be on paper, there was a consensus that keeping the data in digital format would improve the efficiency and transparency of land registration. The Finnish and German pilot projects had stored land registration data in simple village databases (one database for each village), and even though these databases did not support the mass production of land titles (due to the difficulty with the civil status formulas) or the registration of subsequent transactions, they showed that also in Cambodia, computers could be used to manage land registration data. The experiences of the pilot projects were a valuable base for the development of a registration system to be used in LMAP, but a lot needed to be done to create a digital land registration system that would be able to handle the systematic registration records as well as subsequent transactions, consolidations and subdivisions.

A number of existing (proprietary) land registration software systems that have been built for use with ESRI software and database systems such as ORACLE or SQL Server, were considered for use in LMAP. Even though the Cambodian land register would follow the same principles as most land registration systems, it was clear that a lot of customization would be necessary to make an off-the-shelf program work in the Cambodian context. With the limited availability of human and financial resources, the project would have to start with a low-tech, low-cost system that could be upgraded and developed further later on.

The options were weighed, and it was considered that to comply with LMAP requirements, a system could be developed consisting of a geodatabase that would store parcel boundaries and an attribute database with an interface in Khmer language to store textual information about the parcel and owner. ESRI's ArcView software was chosen for the geodatabase, and MS Access for the attribute database. Both packages are popular in Cambodia because they are easy to learn, support the Khmer character fonts and can be customized to local needs.

3.2 The first version of the CALIS

Logistics and legal developments (among which the decision about the parcel form and the title layout) caused a delay of the start of the systematic registration. This delay meant precious extra time for the development of the system.

The first version of the CALIS system was designed by taking into account the data input and expected outputs. For the map data, the main input was the field sketch and the boundary points, based on which the parcel boundaries would be digitized. GIS tools were developed to import the boundary points, to set the projection for the digital orthophotos and to record information during digitizing such as the user name, date of digitizing and the village code which is added as a prefix to the parcel number that the digitizers enter for each parcel

polygon. The map data forms the base for the Cadastral Index Map and the Land Title, which includes a map of the parcel.

The cadastral database was designed as a normalized relational database, following the principle that information should not be stored more than once, to reduce storage space and facilitate updating. The main input for the attribute database was the information of the Parcel Form. The Parcel Form was designed and used for systematic registration during the pilot projects to record information on the parcel such as land use and whether it is public or private land; and information about the owners such as their name, date and place of birth, parents' names, and ID card if they have one. Also restrictions on the land such as lease or mortgages are recorded on the Parcel Form. At the start of LMAP, efforts were made to standardize and categorize the Parcel Form as much as possible. The creation of information categories would speed up the filling of the form and the recording of the information in the database, because the officers only have to pick the correct category from a list. The categories allow for data recording in numeric codes, each code referring to a category of information. Storing numeric codes instead of text strings would not only keep the database files compact but would later on make the inevitable conversion to Khmer Unicode font a lot easier. Of course, some part of the data such as owner names and the name of the land could only be stored as text information.

Even though at this time the legal framework for the registration of subsequent transactions was not finalized, the CALIS system was designed for the registration of transactions, subdivisions and consolidations from the very beginning.

Then in August 2003, everything started to happen simultaneously. Systematic registration started with 14 Land Registration Teams in 8 provinces. The teams, which consist entirely of Cambodian government staff, include demarcators, surveyors and adjudicators for the field work; and GIS and data entry officers for the office work. The 8 provincial offices were equipped with computers, printers and A0 sized plotters. Since the electricity supply is not stable in Cambodia, the computers were connected to UPS devices to compensate for power interruptions. For every provincial office, an IT officer was appointed with the responsibility to maintain the peer-to-peer computer networks, manage user accounts and ensure daily backups of the datasets.

The first version of the CALIS system was installed in September 2003, just in time for the office teams to start processing the parcel forms with adjudication information collected by the field teams. 15 ArcGIS licenses were installed (1 for each office team and 1 for the central office in GDCG) so that the GIS officers could start with digitizing the parcel boundaries using the boundary points that were being collected by the demarcation officers. With this first version, land titles could not yet be printed. A decision on the layout of the Land Title had not yet been taken by the MLMUPC; there were logistical problems with the paper for the titles, but also, developments to automate the title printing process were still ongoing.

3.3 Automating the title printing process

3.3.1 Civil status formulas

During the pilot projects, efforts were made to automate the title printing process but the civil status formulas were a bottleneck. To print the title, the cadastral officers had to go through each parcel record and decide which formula matched the civil status combination, which was very difficult, time consuming and prone to human error. To avoid mistakes in the choice of the formula and to make the printing process efficient, the process had to be automated. To print the amount of titles that would be produced by LMAP, it should be so that a range of titles or even all titles for one village could be printed through one button-click.

To start with, the authorities released a list of possible civil status combinations and resulting formulas. When the list was analyzed, it appeared that the formula depended on the kind of property (which can be property of husband, property of wife, single property, property of husband and wife, undivided ownership or legal person owner) the sex of the owners, the civil status of the owners, and their age (minor or adult). If (one of) the owner(s) is incapacitated or a minor, the sex of representatives will also influence the formula.

Every formula was given a numeric code, and the conditions for each formula were clarified. Then, the coding could start. For every formula, If ... Then statements were created in which the kind of property, the civil status of the owners and their age were checked. Impossible civil status combinations were coded as well, so that the officers would receive a message when a formula could not be generated. Finally, the official Khmer formula sentence was constructed for each formula number, using the owner names and kind of property as variables. Now, when a cadastral officer has finished typing the owner information of a parcel record, the formula is automatically deducted from the information that was entered. The numeric code of the formula is stored in the parcel record. Then, the actual formula sentence is produced and displayed on the bottom of the form.

For example, a case where the land is registered as property of husband and wife, but the wife is deceased, results in formula number 12:

ឈ្មោះកម្មសិទ្ធិករ ឆឹង សុផាត (ពោះម៉ាយពីខ្មោច នាង ឈួន មឿន) និងទាយាទខ្មោច នាង ឈួន មឿន
*Registered to Choeng Sophat (widower of the deceased Ms. Chhaun Moeun)
and the descendents of Ms. Chhaun Moeun*

Elsewhere, a Land Register would normally list the name of the surviving spouse as well as all the names of the descendents as owners of the land parcel, but in Cambodia this is not the custom. In many families, there may be children from different spouses and it is not always clear who is the rightful heir of an inheritance. This particular formula is intended to clarify that the property belongs to Mr. Choeng Sophat and the children from his marriage with the deceased Ms. Chhaun Moeun, but not to any of his descendents that are not the children of Ms. Chhaun Moeun (names have been changed and do not refer to real persons).

A total of 56 formulas were automated in this way. To reduce the amount of information to be stored, only the number of the formula is recorded in the database. From these formula codes, the actual formula sentence is reproduced when needed for title printing or display.

3.3.2 Possession titles vs. ownership titles

Possession rights have been a part of the Cambodian culture of land registration for centuries, and possession titles are issued in cases where state land has been cleared for cultivation less than 5 years before registration. According to the Land Law 2001, ownership titles can only be issued to those who have documental proof of acquiring the land through purchase, donation or a court decision, or those who have been in legal possession of the land for more than 5 years. Persons who have land in legal possession for less than 5 years, can receive a possession title, and when they have completed the 5 years of possession, they can be registered as the owner of the land.

To automate the title printing process, the conditions for possession titles were programmed so that the kind of title (ownership or possession) could be determined automatically using the date of possession, the land tenure date and the legal status information as inputs. Depending on the outcome, the Khmer equivalent of ownership or possession title is printed automatically on the title.

With the automation of the civil status formulas and the conditions for possession titles, the printing of Land Titles and Land Book pages was no longer a bottleneck. The title printing functionality was added in November 2003 and by the end of 2005, more than 400.000 titles had been printed.

3.3 Further development of the CALIS

Technical developments continued to improve the CALIS system, and application updates were installed in the province offices regularly. Sometimes, the MLMUPC announced new regulations that had to be built into the system. Also the cadastral officers in provincial offices made requests for additional functionalities and improvements. Occasionally, a new civil status formula had to be added when a new civil status combination was found.

3.3.1 Querying by name, ID card or address

Since January 2004, the land registration data could be queried by owner name, owner ID card or street address as well as the parcel number. With this functionality, the land records are much easier to access than would be the case with a paper system.

3.3.2 Title receipts and title fees

To facilitate the title issuing process, a functionality to print title receipts with automatic calculation of title fees was added in June 2004. Title fees are based on land value zones; the highest fees occurring in urban areas and lower fees in rural areas. In rural areas, the fee also depends on land use; higher title fees must be paid for residential parcels than for parcels with agricultural land use. For a rice field of half a hectare in a rural area, the title fee is 5000 Riel

(USD 1,25) while the fee for a residential parcel of 500 square meter in Phnom Penh would be 50000 Riel (USD 12,50). The exact fees are calculated by the system based on parcel size, land value zone and land use, and printed on title receipts with the name of the land owner.

3.3.3 Archiving

Also in June 2004, an archiving function was added to comply with the Ministry's regulation that the land registration data must be archived before and after Public Display. Digital archive files are stored village by village, and they are in fact a snapshot of the data on the moment that it was archived.

3.3.4 Password security

With the increase in data volume and growing number of land registration teams, more security had to be added to the system. Different password levels were added; giving the officers access to only the data that they need to work on. Basic user passwords were created for data entry officers, which allow the officers to add land records to the database, but not edit sensitive information such as owner names. The passwords were grouped by team, so that the officers that belong to one team cannot edit parcel records that were created by another team. Administrative passwords were created for officers with the responsibility to edit owner information when needed and transaction passwords were created for officers who handle the registration of subsequent transactions, subdivisions and consolidations. All changes to the owner information are kept in a log so that it can be traced who changed what on which date, what the content was before the change, and what it became after the change.

3.3.5 Statistics

On request of the provincial office teams, statistical reports were designed that can be printed from the system. These reports, that contain statistics on data entry, land use and parcel size, number of printed land titles etc., are used as monthly reports to the MLMUPC. Over time, many more statistical reports have been added that are used to monitor the land registration progress.

3.4 Registration of Subsequent Transactions

The registration of the first subsequent transaction with the CALIS took place in Takeo on 13 Jan 2005. This was a milestone, since the registration of transactions proved that the CALIS could work as a full functioning land registration system. The functionality for transactions including consolidations and subdivisions had been included in the system from the beginning, but the legal framework was not ready to handle the transactions until this day, thus allowing time to fine-tune the technical process in the system.

3.5 More IT investments

By the end of 2004, the project had expanded to 11 provinces and the addition of new land registration teams (including office teams) put a heavier burden on the system. In the Phnom Penh office, 6 office teams with a total of 36 officers were simultaneously using the registration database. The peer-to-peer computer networks could no longer handle the

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network traffic, and the data entry officers often complained that the "system was stuck". The project purchased network servers, which were installed in March 2005. The configuration of Local Area Networks with servers and network switches solved many network problems and made the office work much more efficient.

Also in 2005, A4-sized scanners were purchased for the scanning of documents such as the parcel form, sale contracts and other legal documents. Now, these documents are being scanned, stored in a digital archive and linked to the CALIS system so that they can be accessed quickly through one button-click.

3.6 Current status of the Cambodian land registration system

Now, in 2007, the Cambodian land registration system contains all the functionalities that are needed for systematic and subsequent land registration through LMAP. It consists of a geodatabase with parcel boundaries in ArcGIS format, and an attribute database with parcel and owner information. The system now contains over 800.000 parcel registrations, and at the current speed of registration, an additional 300.000 parcels would be registered every year. The data tables, which are now too big to be kept in Access databases, are being migrated to SQL server databases. This overhaul is hardly noticed by the office teams, because the interface that data entry officers use to process information, is still the same Access application that they are familiar with.

Even though the target number of 1 million registrations will be reached soon, the Land Register still covers only a small part of Cambodia. LMAP covers currently only 11 of the 24 provinces in Cambodia and even in these provinces the systematic registration is far from being completed. The estimated number of land parcels is 7 million, based on the number of applications that were submitted in 1992 and the population growth since then. But seen the average size of the parcels that have been registered so far, it seems that the actual number of land parcels to be registered will be much higher, maybe closer to 15 million. It will take at least another 10 years to complete the systematic registration for the whole of Cambodia.

The Land Register still formally exists in 3 paper copies; however in practice it is the digital register that reflects the most updated information. The updating of the paper copies has fallen behind, especially at the national level. The GDCG is running out of space to store the paper copies of the Register, and the human resources needed to keep the national level Register up-to-date with subsequent transactions are lacking. Discussions are ongoing whether the digital register can be recognized by the Law, and to replace the national level paper Register with digital backups from the provincial databases. Confidence in the digital Register is growing, and also the senior cadastral officials recognize that maintaining the paper Register is becoming more difficult, if not impossible in practice, and requires more resources than the GDCG currently has.

Up to now, there has been no private sector involvement in land registration in Cambodia. Plans exist to outsource some of the activities such as land surveying and information dissemination. MLMUPC still does not have official policy and plans to outsource the

maintenance of the land registration system and the computer networks on which it runs. Although the private IT sector in Cambodia is booming, technical skills in ICT are very limited in MLMUPC, like in most public sector agencies. For the maintenance and development of its land registration system the ministry has so far relied on foreign technical assistance. GDCG staffs have been trained in GIS and database management and can handle the technical support of the provincial offices and training of new teams in the use of the system. However, international support will still be needed for the maintenance and further development of the system.

One aspect that has so far been largely ignored is the accessibility of the land register information to the general public. To be more useful, the information should be available to stakeholders and policy makers needing information on land. From the CALIS system, information can be printed out and provided to consumers. This is done on a limited basis in the GDCG, and no policy, list of available products or prices have been defined yet for the provision of information from the Land Register. To increase accessibility, the land registration information should be provided on-line over the internet in the future, as is done in most developed countries.

There might be many reasons why so few information from the Cambodian government, stored in government databases, is available to the public, and this paper is not the place to discuss all of these. But one technical reason is the difficulty to distribute text in Khmer language over different computer platforms and over the internet. To make the land registration data available over the internet and provide a better service to customers, another hurdle must be overcome: the conversion to Khmer Unicode.

4. ONE MORE HURDLE

4.1 Khmer language and Unicode

Khmer is undoubtedly one of the most complex languages of the world, especially when it comes to teaching a computer how to handle the Khmer script. The Khmer script contains subscript characters which are arranged in a seemingly random way around the main characters to form a word, sometimes to the left, sometimes to the right, sometimes stacked vertically. In a Khmer text there are no spaces between words; a space is used to indicate a pause in reading, rather like a comma in English. This makes text processing functions like word count, spelling control and line-breaks very difficult.

Since the time that the use of computers was first introduced in Cambodia, computer fonts have been developed to enable computer users to type in Khmer. These fonts, called True Type fonts are now widely used in Cambodia for printing and publishing. However, problems occur when viewing a text on different computers, in different programs. The Khmer fonts, while supported by some software packages such as MS Access, are not good for distributing text over the internet. This is where Unicode comes in.

The Unicode Standard is the universal character encoding scheme for written characters and text. It defines a consistent way of encoding multilingual text that enables the exchange of text data internationally and creates the foundation for global software (The Unicode Consortium, 1991-2006). Seen the complexity of the Khmer script, the development of the Khmer Unicode has been a remarkable effort. Unicode 3 (released in 2000) was the first version to include Khmer characters; however at that point, Khmer Unicode was far from being accepted for use in Cambodia. The main issue was the Virama model for Khmer subscript characters, which was not accepted by Khmer linguists because it would be at odds with the way the Khmer script is taught at schools in Cambodia. However controversial, the Virama model allows users to type phonetically and it reduces the number of keys that need to be typed for each character, thus making the typing much easier and quicker. Unicode 4.0 was released in April 2003 with substantial improvements and more Khmer characters. Another major obstacle was removed in September 2005 when Khmer Unicode Keyboard version 1.0 was released by NiDA (National ICT Development Authority of the government of Cambodia). Now that Unicode 5 has been released (in July 2006) with even more improvements, the Khmer Unicode should be ready for use by LMAP.

4.2 Conversion to Khmer Unicode

If LMAP had started in 2007, the land registration data would have been recorded in Unicode instead of the true type font Limon. Now, all text information will have to be converted to allow public access of land registration data over the internet. Conversion of the attribute database to Unicode will be one of the biggest IT challenges that the LMAP project faces in the coming months or years. Since 2005, conversion tools are available to convert text from the Limon font to Unicode, but the accuracy of the conversion is not 100%. The conversion requires complex reordering of characters (in true type fonts you type from left to right, in Unicode you type phonetically, which often goes right to left) and the results of the conversion will, in most cases, leave some characters in the wrong place. The part of the information that is stored in numeric codes does not need any conversion. But textual information such as the name of the land, the owner's names and place of birth must be converted accurately. Great care must be taken with the names of land owners, as even small mistakes can result in a complete different pronunciation of the name.

A test conversion of 100 owner names was conducted using the Khmer converter, a free downloadable tool that converts legacy Khmer fonts to Unicode (Khmer OS Initiative, 2004-2007). It took less than a second to convert the 100 names, but when the results were viewed, it appeared that only 32 names were converted correctly. The other 68 names had mixed up characters or wrong characters. This test conversion indicates that while the actual conversion of the database can be done quickly, the editing and correction of the converted text will take many months to complete.

With more than 1000 daily registrations and subsequent transactions, it is not acceptable to interrupt the registration work for more than a few hours. The editing and correction of converted text must be done while the database is being used.

4.3 The plan

A plan is under preparation that will enable a smooth conversion without disturbing the office teams too much. An updated interface has already been developed, enabling the users to type new textual information in Unicode fonts. In the new interface, existing textual information such as owner names is displayed (read-only) in Limon font as well as in converted Unicode font. When this new interface is installed, data entry officers will have to learn typing in Unicode. This will slow down the office work, but after the officers have familiarized themselves with the new font, the typing in Unicode will actually be faster than with the old Limon fonts. The textual information must be converted from the Limon font to Unicode within a few hours, or one day at most. After the conversion, which will leave most information with incorrect characters, a few officers in every provincial office would dedicate themselves full-time to the correction of the converted Unicode text. They can do this through special conversion forms that display the original text in Limon font and the converted text in Unicode. Before land titles or reports are printed, the textual information in Unicode must have been corrected first, giving the office teams the motivation to correct all information eventually. The conversion of 800.000 land records to Unicode will undoubtedly be a large effort. But the longer it is postponed, the bigger the job will be.

5. CONCLUDING REMARKS

The Cambodian Land Registration System has been in constant development over the last few years. Technical developments went hand in hand with legal developments, thus responding to the changing Cambodian land registration requirements. In the 21st century, digital systems are the only right way to go. The CALIS has started out as a simple set of tools, but is gradually growing up to become a more sophisticated land information system. The local land registration needs and the required functionalities for the users are what drive the system development, rather than the latest technology available.

Land policy in Cambodia, as in any other country, is a sensitive issue. Developers of land registration systems must find a balance between complying with international standards and supporting local needs. It is felt that the capacity of the CALIS to support local requirements that are part of the cultural heritage such as the possession title, civil status formulas and the Khmer language, has contributed to its acceptance by the Cambodian government.

International standards and model cadastre systems are very useful as a guideline for the development of cadastral information systems in developing countries. But first of all, local requirements must be taken into account. The Cambodian land registration system will continue to develop at Cambodian pace and within a decade or so, with international support, it could come surprisingly close to the principles of FIG Cadastre 2014.

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BIOGRAPHICAL NOTES

Gertrude Pieper obtained her degree in Human Geography from the University of Utrecht in 1994. She has worked as a GIS consultant with IT companies in Germany, Portugal and Finland. She has also worked with FAO in Honduras and in Rome.

In March 2002 she started to work with FM-International Oy FINNMAP, and in October 2002 she joined the Finnish Technical Assistance Team as IT advisor for the Ministry of Land Management, Urban Planning and Construction in Cambodia.

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