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A Proposed Partnership between Censuses and Cadastres for the Census 2010 round

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SCORUS Workshop 3

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Cadastre ConCensus-- A Proposed Partnership between Censuses and Cadastres for the Census 2010 round

1. Introduction

In Northern Europe we have enjoyed well functioning cadastres and land registration systems since the 19.th century. In contrast, most disadvantaged countries suffer under high levels of informality, insecure land tenure and lack of basic information on land and housing.

Land information, secure land tenure and orderly land management has been widely acknowledged as the enabling environment for

- Investments and economic development;
- Sustainable natural resource management;
- Protecting the access to land for disadvantaged groups,
- Good governance and
- Providing a sound basis for property valuation and taxation.

The economist, Hernando de Soto, argues that the lack of formal property registration is a cause of underdevelopment and an impediment to economic development (Soto 2000), although this is debated.

The natural link between land and population is attracting growing attention with the scarcity of resources, population pressure and massive urbanisation process taking place. In the latest UNFPA report on "The State of the World Population 2001",

<http://www.unfpa.org/swp/2001/english/>,

substantial parts are concerned with the scarcity of land and water, land degradation, etc. and the interaction between population development and environment. Chapter 6 includes as recommendation for actions to "Improve the information base for more-sustainable population, development and environment practices."

Information on demography on one side, and land and property information on the other, has tended to be established in completely different environments, in different forms and through processes without interaction.

At a first glance the two types of data appear to have little in common. Usually, census data is presented and used at generalised levels, while surveyors have worked at parcel level with detailed data. Despite all the differences in character and nature, some common features shall be presented in the following. It is argued that the two types of functions, censuses and cadastres, have common interests and could potentially benefit from closer cooperation.

A: THE CADASTRE PERSPECTIVE:

2. A Need for New Strategies of Establishing Necessary Land and Property Data

The centrality of property information and a functional infrastructure for land tenure systems is illustrated by the large amounts of land administration projects planned or in progress by international donors, notably the World Bank, having currently about 200 programmes related to land and housing administration in the project cycle to a total loan value in the order of magnitude of 16,5 billion USD (2002). However, even these huge programmes will only reach minor parts of the total areas uncovered by land information and land tenure regularisation.

Full coverage of information is the first and most pressing demand. Yet no existing strategies in cadastre and land registration offer complete coverage within a limited number of years. FIG Cadastre 2014 concept is focused on the conceptual development of the information and models for the data and information systems.

Inventories of the current state of cadastre and land information development are being prepared by D. Steudel, see <http://www.swisstopo.ch/fig-wg71/>. Few cadastral organisations in the developing world have completed systematic cadastral works and land titling for their whole territory, and even in countries where this has been achieved it has been an effort of decades. The successful Thailand Land Titling project is an endeavour of more than 30 years. Many cadastral organisations have not so far been able to cope with the demand for mass registration and regularisation, and only minor areas of the developing world are within a formalised land registration system. Massive areas of informal settlements are evidences of such shortcomings and dynamics in settlements, whether rural or urban, occur at a much faster rate than the existing organisations or traditional approaches to regularisation can cope with. Furthermore, the cost of titling programmes generally exceeds the scarce economic and technical resources available in countries with low GNP. The newest research in land

administration questions if a conventional land registration system is a desirable system for all countries or all areas within countries.

Cadastral and land registration have not progressed further on a global scale due to a large amount of obstacles encountered in administrative structures and the high establishment costs with current methods.

Classical land registration is a tedious technical-legal process involving extensive fieldwork in order to achieve a systematic description of the properties (a cadastre) and registration of the associated legal rights for each individual property. The steps in the process normally include:

- Detailed mapping;
- Legal inventory of records and files by territory;
- Public campaign both at general and local levels;
- Calling forward all claims to land;
- Area by area field inventory of each property and restricted rights with identification of boundaries;
- Systematic adjudication of properties and legal rights in a legal process with representatives of the parties concerned;
- Publication of results with appeal options;
- Final decisions and registration in files, maps and data bases;

Land registration is dependent on both a technical capacity and the active support and involvement of the local communities and local leaders.

The urgent needs for land information and land tenure security has been forcefully expressed by Dr. Anna Kajumulo Tinajuka, Executive Director, United Nations Human Settlements Programme, UN-HABITAT, (FIG, 2002). She argues that the ability of cities and other human settlements to manage their growth is very much dependent on availability of and access to adequate spatial or land information for planning, land development, infrastructure and services, environmental protection and tenure security. She calls for simpler, more cost-effective and accessible survey and land information technologies and processes as aid to more effective planning, development, and management of towns and cities.

It can be noted that Dr. Tinajuka mentioned different levels of application of land data: The individual property level (Level 1), and: The land information needed for effective planning, project implementation, slum upgrading and management of towns and cities (Level 2).

It is suggested here that land information needed for Level 2-type purposes may to a large extent be derived from small area statistics, notably the most recent round of censuses. It is furthermore assumed that the resulting data at level 2 will facilitate establishment of level 1 land data, if and when needed, as discussed below.

The most important source of data for small geographic areas is censuses of population and housing, which hold the one virtue that no other socio-economic data set possesses: full, simultaneous, national coverage. National censuses are taken in almost all countries every 10 years (or 5 years) and census taking entails census enumerators visiting all households and filling in questionnaires for every household and every person in the country through a huge field operation conducted in a short period. A few countries conduct register based censuses. Seen on a worldwide scale it is an operational achievement to record more than 6 billion persons and their households.

3. Potential Synergy of Integrated Planning of Cadastres and Censuses Operations

The purpose of my current investigations is to explore ways of creating synergy between the Censuses on one side and development and implementation of new approaches to cadastres and land registration on the other.

One hypothesis is the existence of mutual benefits and potentials for National Cadastre organisations in developing a partnership with Census Agencies for establishing countrywide coverage with basic, spatial data.

Both type of operations face difficult challenges in the developing world and have some features and tasks in common:

1. Censuses of population and housing are facing a funding crisis, while the demand for better and updated data on population and housing increases http://www.paris21.org/htm/TT_census.htm; Initiatives have been taken by statisticians to seek alternative models of financing and approaches, see www.Paris21.org, calling for new partnerships in statistics.
2. Traditional approaches to establishment of cadastres cannot meet the urgent needs for full coverage of land and property information vital for planning, project implementation, slum upgrading, land transactions, etc. There is a global call for providing secure land tenure from international organisations, ref. UN-Habitat Global Campaign for secure land tenure, see <http://www.unhabitat.org/campaigns/>; as well as professional communities and NGO's, see the FIG-Bathurst declaration, <http://www.fig.net/figtree/pub/figpub/pub21/figpub21.htm>.

Both the mentioned Global Campaign and the Bathurst Declaration fall short of providing operational guidance on how to achieve their objectives. The challenge is for professionals to come up with simpler, speedier, more cost-effective and accessible survey and land information technologies and processes.

The Statistical community on their side have shown a keen interest in improving the quality of mapping.

Raj R. Tripathi states that the success of the census in terms of enumeration coverage and data quality largely depends on the quality of cartographic preparations. (Symposium 2001/08, Statistics Division, Department of Economic and Social Affairs, UN).

K.E. Vaidyanathan makes a specific reference to the dependency of Statistics organisations on cadastral and mapping authorities, identifying census mapping as the weakest area in the preparation for the census in every developing country, which needs to be addressed. According to Mr. Vaidyanathan it is necessary to strengthen the cadastral and mapping authorities to carry out revisions of maps on a regular basis at least once every five years. (Symposium 2001/49, Statistics Division, Department of Economic and Social Affairs, UN).

It can be seen that cadastre and mapping agencies are considered key partners in census preparations. In some countries, e.g. in Columbia, Cadastre and Censuses are organised within the same Agency,

"Departamento Administrativo Nacional de Estadística" - DANE. In most countries, however, the mentioned partnership is still rather weak, and leaves much room for development.

B. THE CENSUS PERSPECTIVE

4. How does Census data relate to Cadastres?

Both censuses of Population & Housing and Censuses of Agriculture include information of relevance for cadastres, having particular value for settlements and rural areas, respectively. Many census questionnaires have included questions on ownership related to property type or status of tenure of the dwelling. Some censuses of Population and Housing even have questions on land tenure. Agricultural censuses are natural sources of information on agricultural holdings and their structure, degree of fragmentation, land tenure, land use, etc. Agricultural censuses use the "holding" as a statistical unit defined as "an economic unit of agricultural production, under single management" (FAO).

Location is a common link between population data and land data, and spatial data is in growing demand, stimulated by the technological advances. Censuses like cadastral works depend on availability of suitable base maps and the spatial definition of administrative areas, communities and sub-areas. The household and the dwelling is a basic unit of censuses, and cadastral data relate to a holding or property typically inhabited by one or more households. The general linkage between population data and space is given through the natural sequence:

Individual \in Household \in Dwelling (\in Property) \in Enumeration Area \in Administrative Area Unit

On this background of complementary challenges a convergence in interests appears to be emerging between the cadastre and statistics establishments, which can be argued roughly by the following observations:

- Both cadastral implementation and censuses depend on updated base maps suitable for field operations;
- Both cadastral implementation and censuses relate to the household as a basic entity, and depend on administrative boundaries at all levels from regions, districts and municipalities to localities and communities;
- Censuses of population and housing are increasingly seeking to improve the quality of base maps and the spatial definition of administrative boundaries and Enumeration Areas to improve the quality of the statistics, whether produced through censuses or sample surveys;
- Departments of Statistics often suffer under insufficient expertise or resources in mapping and spatial data processing (GIS).
- Cadastral organisations usually hold a large share of the technical expertise available in a country in respect to mapping, surveys and Geographic Information Systems.
- Both type of organisations need to provide country wide new data based on the household level and local administrative units, under severe constraints and limited resources.

The potential for increased efficiency and cost saving is illustrated by the fact that census operations cost in the order of 1-2 USD per inhabitant in the developing world, and land titling programmes cost in the order of magnitude of >USD 30 /title. Agricultural sample surveys in Africa have reported generally high costs per unit (up to 100 USD /holding). Census taking is expected to be a recurring event, while establishing of cadastres and titling programmes should be a one-time event. The potential benefit of improved information disaggregated on small areas is vast.

While establishing cadastres and land titling have some traits in common with census taking, there are substantial differences, as well. Most importantly, census data on individuals has to be protected as confidential and to be agglomerated within a sub-area, which guarantees anonymity.

Cadastres, on the other side, are more than data. Cadastral data is the result of a legal-technical process within an institutionalised setting. The step from data capture to formalisation of legal rights is a significant one, which depend on an institutional framework capable of defending the registered rights and keeping the system updated.

It is argued here that Cadastral Agencies could learn from the Bureaus of Statistics in considering different strategies and sources of data: Censuses, (sample) surveys and administrative records. Censuses are in some countries based on registers. Interaction between administrative records and statistics is well developed in countries with high levels of public registers.

In a similar fashion it is suggested that cadastre agencies consider the full range of data collection methods and strategies towards fulfilling the information needs.

Much work remains to be done in the area of developing land tenure indicators, and in developing census questionnaires accordingly. Physical planners, urban managers, etc. could greatly benefit from having such data available at disaggregated level. It is envisioned that an incremental and phased approach to establishing land and property data based on small area statistics could provide earlier results.

5. The Importance of Administrative Boundaries and Community Boundaries

Administrative boundaries are usually important delimitations of land managed under different legal-administrative regimes, for which reason settlement of administrative boundaries is an important step in land titling.

Raj R. Tripathi (2001) states that in order to meet the rising demand for data for smaller areas, census offices in most countries have decided to demarcate Enumeration Areas (EA's) based on the framework of villages, localities or other low-level social structures. "EA's delineated by this method would not cut across village or locality boundaries and therefore facilitate production and dissemination of census data for smaller areas." (Symposium 2001/08, Statistics Division, Department of Economic and Social Affairs, UN)

In cases of titling activities, one of the management challenges is to estimate the number and type of holdings in each area, as many costs and operational factors depend on these parameters. Therefore availability of data on housing and households disaggregated on the smallest spatial unit, EA's, well defined and enclosed within administrative territories, would facilitate planning of titling projects and reduce the risks of implementation. In determining administrative and community boundaries census managers like surveyors recognize the importance of involvement of local leaders. Boundaries have to be agreed upon by the concerned parties through local negotiations and formalised procedures.

In many cases, the toughest hurdles in clarification of rights are associated with community boundaries.

In Ghana, for example the majority of disputes involving the Land Commission are concerned with higher level stool land boundaries.

In areas dominated by communal tenure systems, clarification of community boundaries and recognition of communities' rights to specific tracts of land are means to limit encroachment by outsiders. Within community boundaries different options of land administration can be considered in addition to individual titling and classical registration systems (Binswanger and Deininger, 2000, S. Hvalkof and R. Plant, 2001).

There is a growing recognition that communal tenure systems may constitute a low-cost way of providing tenure security, which at the same time permits internal flexibility, if combined with accessible mechanisms for dispute resolution and enforcement (K. Deininger and H. Binswanger, The World Bank). In such cases land administration would not generally be concerned with the delimitation of parcels or properties within the community, but be restricted to settlement of community boundaries as is the case in many ongoing indigenous titling projects (ref. to Perú, Bolivia).

In slums and large, dense informal settlements with irregular and intertangled structures geometric delineation and surveys of plots would be impossible and meaningless. In such areas it appears that disaggregated data on neighbourhood level would suffice for a number of planning and administrative functions.

Settlement of administrative and community boundaries consequently constitute high priority tasks for both censuses and for land administration.

6. Spatial Resolution of Census Data and the suitability data for land information systems (LIS/GIS)

Use of disaggregated levels of census data has been promoted by Bond (2000), who states that recent developments in GIS and spatial analysis brought about developments in ICT that will lead to a situation, where the full potential of censuses can be realised. Bond suggests that Censuses should play a central role ensuring that the information contained in such data is effectively realised.

The smallest spatial unit of census data is the enumeration area (EA), subunits of administrative territories, see definition of national census geography in the UN-Handbook for census mapping, 2000. The size of Enumeration Areas vary to fit with the number of households, which one enumeration team can cover during the duration of the census taking into consideration operational aspects like terrain and transport. Typically, it will include 100-150 households, resulting in quite small spatial areas in urban neighbourhoods. In other words, the spatial resolution of census data is high and well suited for a range of planning purposes, when used at a disaggregated level. An important topic of discussion is the error and bias of census data (see B. Davis, 2003) and what aggregation level to choose for particular purposes. EA's have considerable size variations, so it is suggested by Tripathi (2001) to group census EA's into more homogenous and equitable units.

A precondition for optimal use of census data on the EA level is that the EA's are well defined in the field and on a base map of suitable quality, whereby the EA-delimitation can be overlaid with digital base maps and census data used in a Geographic Information System (GIS). It can also be seen that it would be desirable from a planner's viewpoint, if EA's were homogenous areas, which could be classified like a zone. Alternatively variations within areas could be described statistically. The availability of low cost GPS navigation equipment is promising for strengthening the spatial dimension of statistical surveys and census data.

In many countries where census mapping is still manual and the maps are sketched, the use of the census data on EA-level for physical planning purposes is hampered by the nature of the map product (poor). Census mapping have in many countries suffered under lack of resources.

It is suggested that it is a priority task to digitise the census frames and bring them into a national reference system. Once this is done a gradual upgrading process can be initiated.

7. Basic Information Systems and Land Tenure Indicators

Basic information systems play a central role in the struggle towards implementing good governance, and small area statistics is highly valued for all types of planning and administration. Public sector reforms and decentralisation relies on establishment of basic information systems for efficient policy decisions and transparency. Generally, it is estimated that data costs constitute well above 80% of the cost of implementing information systems. The benefits of technology will be limited unless there is made an effort to establish good data.

The Millennium goals has strengthened the attention on poverty alleviation and poverty mapping, <http://www.worldbank.org/poverty/inequal/povmap/data1.htm>.

Land ownership and housing figures prominently in most composite indicators of poverty.

Leclerc, Nelson and Knapp (2000, CIAT) examine methodology issues related to the measurement and geographical characteristics of poverty at different levels of aggregation. Their work on deriving indices from household census data shows that the index of "lack of housing size and quality" explain well other poverty factors. Furthermore, they stress that the choice of aggregation scale matters as much as the choice of indicator.

Constructing indicators is therefore highly relevant for the professional community involved with cadastre land registration and land administration. Land administrators have not so far paid attention to the development and use of indicators for planning and monitoring.

UNHABITAT in its recent Expert Group Meeting on Urban Indicators, "Secure Tenure, Slums and Global Sample of Cities, Oct. 2002, recommended the following operation definition, "Secure Tenure is the right of all individuals and groups to effective protection by the State against unlawful evictions" focusing on the extreme case of insecure tenure.

Furthermore, the Meeting recommended to:

"- Develop a global operational definition of the term "secure tenure" that can be used as a meta-indicator for monitoring slums and tenure conditions world-wide.

- Propose a set of sub-indicators for the development of a composite index on secure tenure at city and intra-city levels, establishing global parameters and integrating some of the local variations.

The indicator selected by UNHABITAT compares perhaps to the definitions of indices of Leclerc et al."lack of housing size and quality" and "lack of basic services and energy". Further work on developing composite indicators on land tenure security is a challenge for the professional community of land administrators. One of the challenges is the integration of quantitative and qualitative parameters.

8. A Window of Opportunity before Census round 2010

The latest round of Censuses of Population and Housing in year 2000 has been completed and data is available. It appears that the cost efficient mapping methods technically available have not fully benefited the statistical applications, in particular census operations. At the same time, improvements in mapping and spatial data acquisition can be expected to enhancing the quality of statistics and to meeting multiple application needs.

Before starting the preparation cycle for next censuses there is an opportunity to develop methodologies and explore how the uses of census data can be widened and deepened. In countries lacking complete and updated property registration systems and data, the censuses deserve special attention as a way of collecting relevant, high resolution indicators.

If methodology development is going to be made in the area of census mapping to be ready by 2010, then planning and implementation needs to be initiated soon, as mapping is generally a time consuming and costly effort, please refer to the UN-document E/CN.3/2002/2, "Review of the 2000 World Population and Housing Census Programme and Proposed plans of the United Nations Statistics Division for the next census decade (2005-2014)".

Prospects of collecting of information on tenure of dwellings and holdings during censuses

The design of census questionnaires vary from country to country, not the least related to the topics of ownership of dwellings and holdings. Examples of questionnaire design are shown in the UN Handbook on Census Management for Population and Housing Censuses (2001), including the designs of recent censuses in Argentina, Botswana, New Zealand, South Africa and Uruguay. Common questions record the physical character of housing and utilities, all useful data for town planning and management and good indicators on land tenure.

In addition specific topics of ownership and occupancy status are included in some recent censuses. In the cases of Argentina and Uruguay there is a question asking, "Are you

- Owner of the housing and the land;
- Owner of the housing only;
- Renting;
- Occupant through relational dependency;
- Occupant through loan, or permission;
- De facto occupant;
- Other".

In Botswana the questionnaire includes the topic "Agriculture and land acquisition":

"How was the land for grazing and/or planting obtained?" (providing the following options:)

Land Board; Tribal/communal; Inheritance; Freehold; Lease/TGLP; Syndicate; Employer, Relatives, etc.; Self-allocated.

As it can be seen, there has already been collected data on relevant topics of housing and land tenure in some censuses of population and housing conducted very recently or in progress. There appears to be an opportunity for developing the design of these topics of the questionnaires and to optimise the use of the resulting data for land administration and as indicators on tenure of dwellings and land.

Function of Administrative boundaries and EA-based data in Land Administration

The delineation of administrative areas and localities is a task of high importance for a range of purposes including cadastre and land administration. Administrative boundaries are usually boundaries of different jurisdiction, so conflicts within administrative boundaries can be treated at a lower level of administration.

Often boundaries are shown on maps in small scales and at a high level of abstraction. Settlement of boundaries has to be performed in a combined legal-technical process with involvement of the local leaders and representatives. The delimitation of boundaries can serve land administration purposes irrespective of type of tenure system and its state of development. Settling boundaries in the hierarchical order will facilitate administration and improve data quality.

Having good spatial delineation of Enumeration Areas will improve the quality of statistics both in respect to collection and use. The perspectives of full use of disaggregated census data in Geographic Information Systems awaits access to digital census frames. Digitising census frames - on the other hand - is depending on linking with national reference systems. Since many census maps in disadvantaged countries have been drafted as sketch maps with poor coordinate references, the task will require some upgrading of the basic maps.

9. Conclusions

It is proposed to promote the use of census data among cadastral and property registration agencies, and to advocate for increased attention to the benefits of intensifying their support for census operations -out of self interest. Cadastral agencies in countries lacking complete property tenure data may reap benefits from intensified use of census data, which include parameters suited for land tenure indicators. Cadastral Agencies may influence the formulation of topics of the census questionnaire, and if better technical support is provided for census mapping, this will lead to upgrading the quality of statistics on ownership and land tenure indicators to be derived from censuses of population and housing and of agriculture.

Development of a basic level of subarea-data on housing and land tenure could be collected with entire country coverage in conjunction with preparations for and taking of the next round of censuses of population and housing in the year 2010+ through:

1. Partnership in census preparations between the National Statistics and National Cadastre organisations on appropriate base mapping
2. Spatial delineation of administrative boundaries, communities, and enumeration areas (EA's); in a joint effort based on locally negotiated solutions;
3. Inclusion of topics in the census questionnaires on housing and holdings, which will help establish a representation of the tenure situation on small areas;
4. Cooperation between the National Statistics and National Cadastre organisations on technical issues, e.g., GIS.

It is envisioned that the basic level of cadastral data achieved through the proposed "ConCensus" approach can serve the development of a land administration system in two ways:

- As land information for use in physical planning, urban management, etc., and
- As input to development of a land registration system with different models depending on the status of the legal-institutional framework, the specific land tenure situation, and the needs in an area.

As an example may classical land registration be irrelevant in areas with low land values and low economic activities.

It has been noted that census mapping usually has been a challenge for census managers and often caused delays in previous censuses. Irrespectively, it is an achievement that national censuses have been conducted at such regular schedules.

It is suggested that National Bureaus of Statistics and National Cadastres share interests in establishing better basic maps and geo-referenced census frames. Investments in better census mapping now, seems to render rationalisation advantages for both Statistics and Cadastre.

The cost of image maps (orthophoto maps, satellite image maps) has been decreasing dramatically over the latest years, and the notion that it is cheaper to prepare sketch maps than proper image maps has to be challenged. Arguments for producing digital image maps as base maps include: better orientation qualities, better quality statistics, time considerations, outsourcing of production and prospects of multiple use and GIS-applications in the future.

For the next round of censuses around 2010 it is time to prepare the long term programme of census mapping. It is argued here that cooperation between all the stakeholders on establishing new census maps for the next round of censuses would render high benefits over costs.

It can be expected that data, which can be collected through the census operation will be low cost, as census operations in general cost in the order of 1-2 USD per inhabitant in the developing world, compared to land titling programmes with a price tag per title in the order above USD 30. However, the products are also vastly different. Clearly, a statistical approach to tenure data collection is not a substitute for land registration, but a supportive step.

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