

## FIG Working Week, Rome

# Technical Sessions: Land Administration & Cadastre

Hundreds of papers were presented at May's FIG Working Week in Rome.

**Richard Groom** guides us through the technical sessions with a focus on Land Administration and Cadastre. In the next issue of GW we will cover laser scanning, geodesy and monitoring. Full papers can be downloaded from <http://www.fig.net/pub/fig2012/techprog.htm>

**Juliana Opoku Nyarku** and **Okumani Adu-Gyamfi** discuss (in TS01E) the urban/rural ('peri-urban') interface on the edges of Africa's cities. These areas of rapid development in can leave the rural poor as slum-dwellers. The paper describes a 'pro-poor' approach to land management and administration in Kumasi through the Ghana Land Administration Project (LAP). However, administration of the LAP places the management of customary land in the hands of Customary Land Secretariats even though customary land owners are the problem rather than the solution. In Kumasi, 83% of land occupiers who responded to questions claimed that their land had been taken over by the traditional authorities and of these only 32% claimed to have been notified about this.

Security of tenure is clearly at the root of the problem yet land registration is too expensive for the poor. The authors recommend that title to individual plots of customary land should, at least to some degree, rest with the occupiers, rather than the local chief; that there is a need for more effective education of the rural poor; and that there should be more stringent enforcement of planning regulations. In session TS02D **Ephraim Danso** and **Michael Barry** gave a different perspective on the topic.

In Tanzania, **Felician Komu** (TS02D) from Ardhi University argues that customary tenure should be done away with completely, in favour of a more transparent government-controlled system. He acknowledges that such a move would face stiff resistance from those with vested interests. He defines the rural/urban clash as between low value unregistered 'customary land' against high value registered land. The argument against registering rural land is based upon cost, but why does cadastral survey have to be "accurate to a fraction of a millimetre"?

In TS01G, **Douglas Black** (National Directorate of Lands and Forestry, Mozambique) urges aid agencies to turn away from sponsoring 'studies' and to focus on the logistics of implementing land governance projects through a standardised approach. On cost, Black describes a process for registering land rights and quotes an average of \$25 per title. The standardisation approach applies to training, equipment and resources. This has the advantage of making the process scaleable. A bottleneck is donor organisations' procurement processes. Standardisation helps streamline these too.

In Session TS09L **Anttonen** discusses lessons learnt from the Cambodian Land Management and Administration Project. They were able to register properties for \$10, surely a success, but the author highlights some lessons for the World Bank, in particular and

has some wise words to help take projects from 'donorship to ownership'.

**Le et al** (TS09L), investigate the differences between the 'standard' Land Administration Domain Model (LADM) and the Vietnamese Land Administration System. One of the difficulties is that land in Vietnam is owned by all people with the state as representative owner, although individuals can own objects on the land, like buildings and can be granted leases and other rights to use the land. The conclusion is that LADM can be applied with modifications to suit local circumstances.

In session TS03A, **Rohan Bennett et al** call for federated countries (Australia, in particular) to adopt national land administration infrastructures so multipurpose cadastres can realise their full benefits. Several other papers in the same session made similar points.

**Enemark** (TS04A) states that, in some way, all countries have to deal with the management of land through the four functions of land tenure, land value, land use and land development. "Spatial enablement is not primarily about accuracy – it is about adequate identification, completeness and credibility" he says and offers ten principles of land administration and three key demands for sustainable land governance: government should be spatially enabled, the spatial framework should be fit for purpose and land governance should support the global agenda.

TS03B looked at the use of crowd sourcing in land administration. **Eliaisa Keenja et al** canvassed the views of Netherlands Kadaster staff members and then used Q-methodology to sort the results into a number of 'belief clusters' – a form of classification and grouping of views. **Robin McLaren** sees the mobile phone as key for transferring cadastral information from the field to the land administration authority. He identifies risks and offers various solutions, particularly through the use of 'community knowledge workers' as intermediaries. Perhaps success depends upon the extent to which the community knowledge workers can be trusted. In this session, **Daniel Steudler** presented the executive summary of an FIG report on Spatially Enabled Societies.

In TS07B, **de Zeeuw** (Netherlands) looks at the way the Dutch cadastre has evolved in response to economic and political changes, including open data, self-service and crowd sourcing. Under the headings "people", "profit" and "planet", the author gives examples of the changes that have so far been made. **Grant** (New Zealand) is concerned about the sustainability of New Zealand's geospatial datasets in an era when positioning technology is putting geospatial

*"... some wise words to help take projects from 'donorship' to ownership."*

applications into the hands of the general public. A cadastral strategy is being developed looking ahead ten to twenty years. **Nyongesa** (Kenya) describes Kenya's programme to convert the Ministry of Lands paper-based records to GIS. Work started in 2008. Records have been prepared for scanning, the country's geodetic network is being upgraded and computer systems are being procured, but the project suffers from funding issues.

In TS07B, **Van Der Molen** (Netherlands) looks at Hernando de Soto's landmark book, *The Mystery of Capital*, and the views of its many critics to see if de Soto's ideas still stand up today. For those who do not follow the reasoning behind the common view that security of tenure is the silver bullet that releases the poor from poverty, Van Der Molen's paper gives a useful and balanced explanation.

In TS01G, **Rizqi Abdulharis** from the Institute of Technology of Bandung, Indonesia presented a paper on land and marine administration on the island of Ambon. This case study describes customary land tenure, land use rules and then their marine equivalents. All fascinating. Whilst reading this, it occurred to me that use of 'geo-fences' to control where fishing takes place could be a more effective way to control the industry than applying landing quotas.

In Session TS09H, **Lee et al** describe the use of network RTK for reform of South Korea's 100 year old paper-based cadastral system. The reforms include the introduction of a 3D digital cadastre and use of aerial photogrammetry and GNSS RTK positioning. Network RTK is used to establish third order control from which the surveyors fix boundaries using traversing.

**Yoo and Ju** present a case study of land registration using satellite photogrammetry in Turkmenistan. They describe a pilot project making use of GeoEye imagery and give details of their methods of ground control and photogrammetry. Of course, photogrammetry does not detect legal boundaries, but in Turkmenistan most of the land is owned by the state, so the priority was to produce base mapping for land information management rather than to secure property rights. It is however strange that having gone to the trouble of setting up stereo models, the project ignored the third dimension and the added value it could bring.

### Education

**Greenfeld** (Israel) has been involved in developing the 'survey body of knowledge' for some years. His paper (TS04i) brings this valuable work up to date with his 'nearly final' findings. **Groenendikf** (Netherlands) *et al* test the attributes of Land Administration to decide if it is an academic discipline. Their conclusion is 'no' but that it is either a discipline in formation or an emerging area of interdisciplinary study based upon land registration and cadastre. **Roy** (Canada) discusses



*Customary land rules in Ambon: Sign showing the application of sasi kelapa, a seasonal regulation which controls the harvest of unripe coconuts. By kind permission of Rizqi Abdulharis*

how the ever increasing scope of geomatics can be taught without increasing the length of the courses. He rejects the idea of withdrawing "less important" courses, instead going for a "new program approach" involving the integration of case studies, problem solving and competencies development. His paper should stimulate some debate.

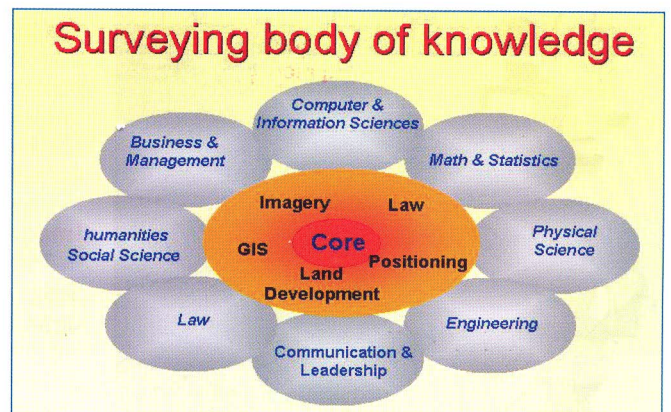
Session TS06A focused on the marketing and management of professional surveying education. **Musungu and Motala** (South Africa) demonstrated that bringing research into the community can motivate people to become surveyors. Indeed, when they asked students what made them interested in studying surveying the answers in order of popularity were: observing surveyors working in their neighbourhoods, from discussions with a relative and through a school visit by a professional land surveyor. **Vaskovich** (Sweden) studies the effects of introducing tuition fees and falling rolls and suggests a solution using a combination of cost cutting and the introduction of innovative curricula.

### 3D SDIs

Session TS06F included papers on the development of 3D cadastrals in Italy, Argentina, Indonesia and Australia. In the latter, **Rajabifard et al** give three principles for the 3D cadastral data model: the 2D cadastral data model is a sub-set of the 3D cadastral data model; the 3D cadastral model should accommodate 3D rights restrictions and responsibilities and their association with

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*The Survey Body of Knowledge (Greenfeld).*



“... bringing research into the community can motivate people to become surveyors.”

Premark for WorldView-2. Inset shows view of premark from satellite. (Mutluoglu)



physical objects and also represent their spatial extent; the 3D cadastre should cater for a broad range of land administration functions including land tenure, land value, land use and land development with sufficient detail.

In TS08H, **Duncan** and **Abdul Rahman** (Malaysia) look at the integration of surface, above surface and subsurface city models. They put forward a topological 3D object-oriented data model and provide a UML diagram for the top hierarchy class. **Breunig** (Germany) et al, consider the modelling requirements for planning, design and construction of a city subway line. They consider the question of scale and generalisation from LoD5 down to LoD1. **Gal** and **Doytsher** (Israel) see 3D spatial analysis of built-up areas as one of the day's challenging topics. They present an algorithm to identify the objects that are visible from a single point. **Agostino** (Italy) et al have been developing a mobile mapping system for 3D GIS data collection. The system includes GPS and INS for navigation, video cameras for imaging and a laser scanner to produce a point cloud on which to drape the video images. However, the product comprises solid images rather than a coloured point cloud.

### Survey Control

In session TS05J, **Chang** (Malaysia) describes the survey control requirements for Kuala Lumpur's Klang Valley rapid transit project. Staying in Malaysia, the national mapping agency (JUPEM) have been tasked with compiling, in a single repository, underground utilities records for the nation. This is a new field for Malaysian surveyors and **Jamil** (Malaysia) et al describe how they are going about this work.

TS03K was a special session on the Japan earthquake of 2011. **Yamagiwa** et al described their approach to dealing with the effect of the earthquake and its aftershocks on Japan's dense network of CORS. One aspect of this was to use the CORS data to assess when crustal deformation had subsided to a level where they could publish reliable new coordinates for the stations. **Yoshikawa** et al discuss the use of multi-source and multi-temporal remote sensing during the incident. They note the value of SAR data for mapping inundation and automatic change detection. **Nagayama** et al describe the response to the disaster of the Japanese national mapping agency and point out some improvements they can make in the light of experience.

### Imagery

In TS05E, **Caprioli** and **Scognamiglio** (Italy) describe the use of satellite imagery from different sources for change detection,

including the image preprocessing steps needed to make the datasets compatible.

In Session TS06I **Akbari** and **Safari** (Iran) investigate various methods of target detection and apply them to hyperspectral remote-sensing data. They find that a new algorithm, Support Vector Machine is a valid and useful alternative to more established methods. **Baiocchi** (Italy) et al study the use of high-resolution multispectral satellite images for coastal monitoring. They use WorldView-2 data and find it particularly useful for identifying wet and dry sand. Looking forward, they anticipate that DTMs integrated with the radiometric results would produce more information.

**Mutluoglu** (Turkey) et al, look at the optimum size for photogrammetric ground control targets for WorldView-2 imagery. **Papakosta** (Greece) et al, propose using linear features to provide ground control in plan for historical photography where points are more difficult to find and more likely to be misidentified. They tested their method on aerial photography from 1945 and note that the results were much better than using solitary ground control points. **Uysal** (Turkey) et al, describe the photogrammetric survey of Afyonkarahisar and Mevlevi Lodge, Konya using a Samsung S730 non-metric camera. Camera calibration was carried out using Photomodeler software; 139 ground control points were surveyed on the historic building

In Session TS07E, **Konecny** (Germany) looks at the economics of various methods for boundary surveying. He sees the topology of the boundary as more important than geometrical accuracy and suggests aerial ortho-mapping to produce preliminary parcel boundaries by image interpretation during the adjudication process but leaves open the possibility to survey by more accurate methods (eg GNSS) in situations where greater accuracy is demanded. This would speed up the registration process. **Marechal** (Belgium) describes the State Boundaries of Europe project to compile a multipurpose dataset, which will be the "definitive" description of all European state boundaries. Belgium is contributing to this through the "General Administration of Patrimonial Documentation" – a government department that maintains Belgium's international boundaries.

### Land fragmentation and consolidation

In TS09E, **Demetriou** (Cyprus) et al, present a new methodology for measuring land fragmentation, which integrates GIS with multi-attribute decision making. The resulting model, called LandFragmentS outperforms the existing indices.

In TS02E **Seija Kotilainen** and **Kalle Kontinen** from Finland advocate the inclusion of environmental protection measures (eg wild field borders and wetland areas) within land rearrangement schemes as a means of reducing pollution in the Baltic Sea area.