

... please turn off mobile phones and pagers. ...

Multi-Purpose Cadastre based on FIG Cadastre 2014 and ARCGIS

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ESRI International User Conference 2003

Agenda

- Data Model Purpose
- Thematic content
- Detailed design discussion
- Implications
- Q & A

Sample Database and Design Documents

See **Data Models** at
support.esri.com/datamodels



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Data Model Purpose

- Develop a data model to support management of cadastral systems of the future
- Basis
 - ideas of Cadastre 2014 initiative of FIG,
 - best practices form around the world,
 - other Cadastral data models,
 - standards
- Provide a solid template for cadastral agencies of the world



Cadastre 2014 - Review

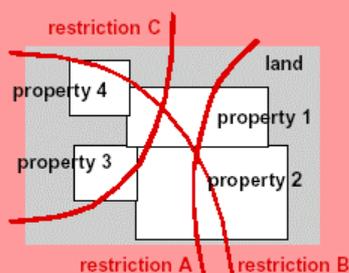
- FIG Working group 7.1 - tasked to study cadastral reform projects in developed countries.
- Elements considered:
 - the on-going automation of the cadastres
 - increasing importance of the cadastre as part of a larger land information system.
- Result - a vision of:
 - where cadastral systems might be in twenty years,
 - the changes that might take place,
 - the means by which these changes can be achieved,
 - the technology to be used to implement these changes.
- 6 Principles of the Vision.



Legal Situation of Land

Statement 1 on Cadastre 2014

Cadastre 2014 will show the complete legal situation of land, including public rights and restrictions!



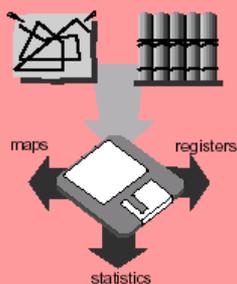
Comment: The population of the world is growing. The consumption of land is increasing. The absolute control of the individual or of legal entities of land is increasingly being restricted by public interest. To provide security of the land tenure, all facts about land must be made obvious by the cadastral system of the future.

Consequences: A new thematic model is necessary. Surveyors must take into consideration public law.



Integration with the Register

Statement 2 on Cadastre 2014



The separation between 'maps' and 'registers' will be abolished!

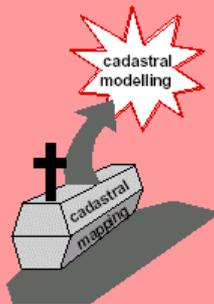
Comment: The separation was necessary because the available technology – paper and pencil – did not allow other solutions.

Consequences: The division of responsibilities between surveyor and solicitor in the domain of cadastre will be seriously changed.



Modeling Over Mapping

Statement 3 on Cadastre 2014



The Cadastral mapping will be dead!
Long live modelling!

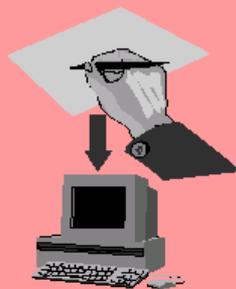
Comment: Maps have always been models, but the available technology did not allow for the use of these models in a flexible manner. So in mapping flexibility had to be brought in by different scales. Different scales had to be represented by different data models. Modern technology allows the creation of maps of different scales and registers in different forms from the the same data model.

Consequences: In 2014 there will be no draftmen and cartographers in the domain of cadastre.



True "E-Cadastre"

Statement 4 on Cadastre 2014



'Paper and pencil - cadastre' will have gone!

Comment: Geomatics technology will be the normal tool for cadastral work. Real low-cost solutions are only possible when this technology is used in combination with lean administrative procedures. Developed, developing, and transitional countries need models of the existing situation to resolve the problems of population, environment and reasonable land use.

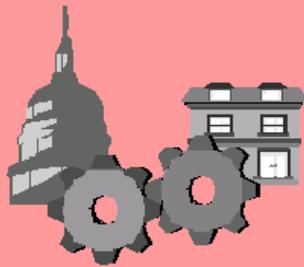
Consequences: The modern cadastre has to provide the basic data model. Surveyors all over the world must be able to think in models and to apply modern technology to handle such models.



Private Sector Involvement

Statement 5 on Cadastre 2014

Cadastre 2014 will be highly privatized! Public and private sector are working closely together!



Comment: Public systems tend to be less flexible and customer oriented than those of private organizations.

Free economies demand flexibility in land markets, land planning and land utilization. Flexibility may be provided better by private institutions. For necessary security, however, public involvement is indispensable.

Consequences: The private sector will gain in importance. The public sector will concentrate on supervision and control.



Cost Recovery

Statement 6 on Cadastre 2014

Cadastre 2014 will be cost recovering!



Comment: Cadastral systems need considerable investment. But the land documented and secured by the cadastre represents a multiple of the investment. The investment and operation costs have to be paid back at least partially by those who profit.

Consequences: Costbenefit analysis will be a very important aspect of cadastre reform and implementation. Surveyors will have to deal more with economic questions in future.



Theory vs. Practice

- New ideas
- Experienced players
- Best practices
- Leadership
- Workshop



Thematic Content

- Many different layers participating
- Key layers at the initial stage



Thematic Layers for an ArcGIS Data Model



ArcGIS™ Cadastre 2014 Data Model - Early Draft

Based on the International Federation of Surveyors/UN Cadastre 2014 Vision

April 14, 2003

The model we created at our workshop shows rights as attributes of the relationship between people and land. This does not easily translate into GIS data structures because it implies the future. Records do not exist on their own or have a graphical representation.

For ArcGIS we prefer to have a structure where the Rights and their Owner Objects are containers. This will work better for implementation, and it is probably more consistent with the Cadastre 2014 vision.

These diagrams below are examples of feature classes and tables based on the UN National Cadastre Task Force Legal Land Rights and Survey Systems with only those countries to specify according to existing rights and survey practices.

Thematic Layers for an ArcGIS Data Model

- Legal Area/Location
- Rights/ Claims
- Legal Land Objects
- Boundaries
- Coordinates, Survey Frameworks
- Field Survey

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Detailed Design Discussion

UML and diagrams

Cadastral Standard ERD Version 1.2.3 - January 2003
Diagram Overview
See following pages for details of entity sets.

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Land Objects

- Three types of Land Objects
 - Legal
 - Informal
 - Administrative
- Very few rules
 - Legal independence
 - Closed polygons

	Polygon feature class LegalLandObject
	Polygon feature class AdministrativeLandObject
	Polygon feature class InformalLandObject



Legal Land Objects

- Legally defined rights and interests
- Primary rights for any cadastre

	Polygon feature class OwnerParcel
	Polygon feature class Encumbrance
	Polygon feature class Separated Right
	Polygon feature class VerticalParcel



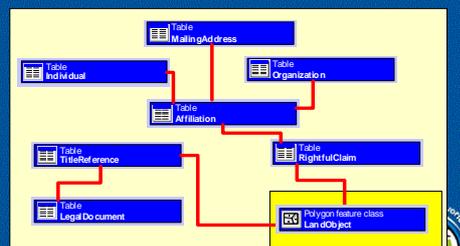
Administrative Objects

- Managed by Government Agencies
- Represent public rights
- Managed independently of individual rights



Rightful Claimants

- Relationship between Legal Objects and people
- US EPA standard – Facility Information Template for States
- Registries



Areas that need more work

- Vertical Parcels
- Other types of Administrative Land Objects
- Buildings / structures on land



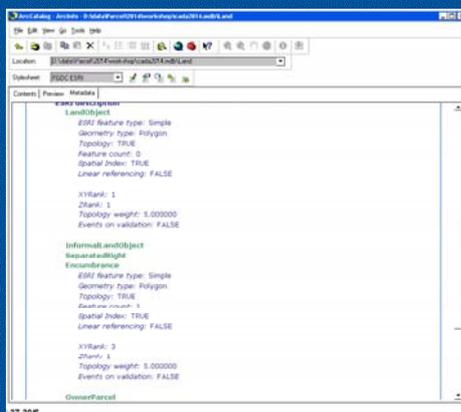
More Work Needed also

- Affiliations
- Survey integration
- Attributes
- Registry



Metadata Documentation

- Metadata is critical
- ArcGIS creates some metadata automatically
- Users need to add / manage additional metadata specific to their implementation



Implications

- Very early stage of design and discussion – still lots of work
- Cadastre 2014 is a good idea
- Good participation of the industry
- It will have implications
 - Workflow
 - Cadastral mapping
 - Integration with registries



Next steps

- Draft model posted on the WEB
 - Try it and share your experiences
- Paper at the FIG Commission 7 meeting
 - September in Krakow, Poland
 - Next draft
- Review in the fall
- Final draft by Christmas



Summary

- More information
 - Data Model Poster
 - Example Geodatabase
 - White paper – **NEW**
- At Data Models section of

support.esri.com/datamodels

