Land Administration: Registration and Cadastre Systems for Properties

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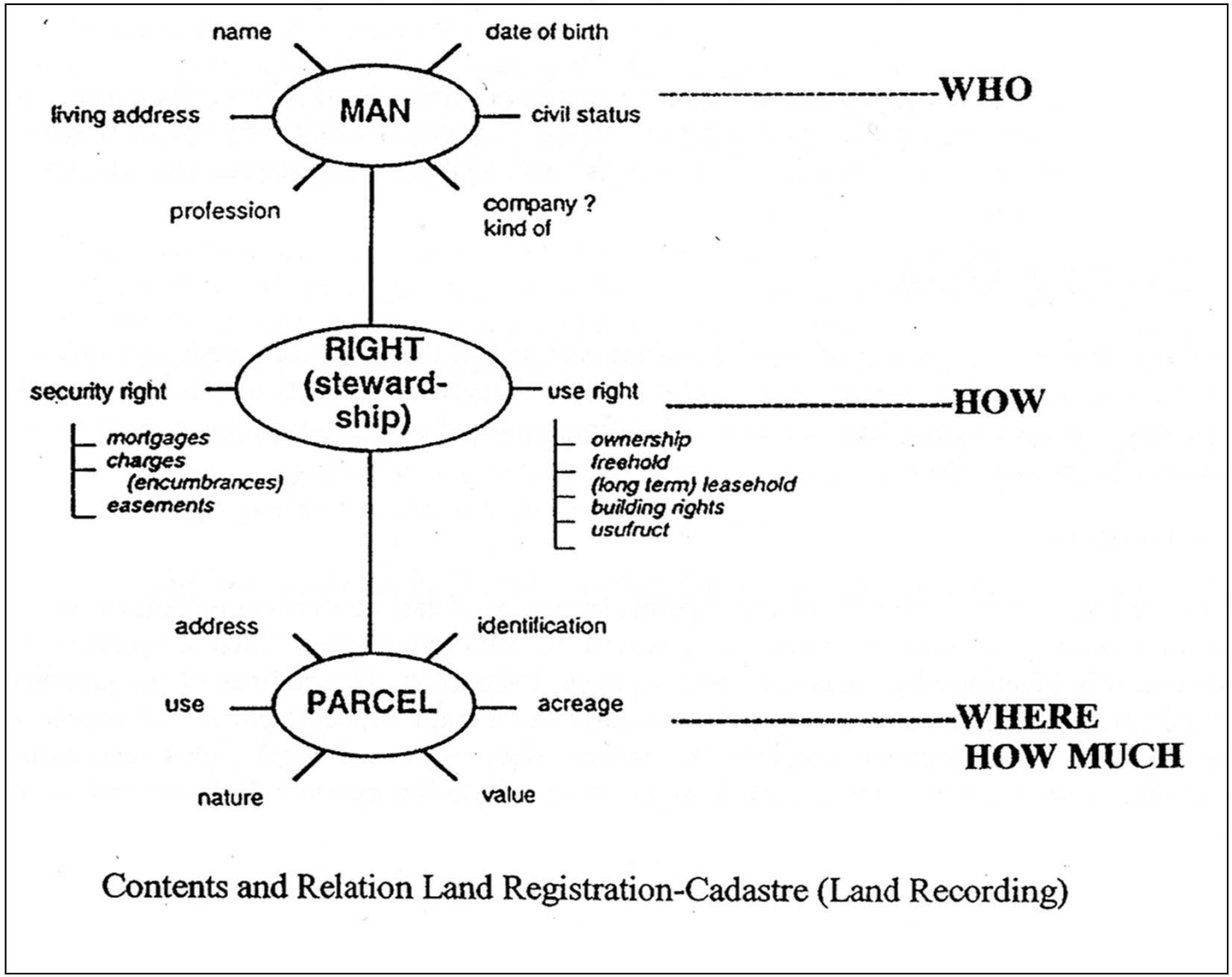
Introduction

- Population growth and technology has altered planetary system
- In response to this change there was a call for action in the report of UNCED called ‘Our Common Future’
- In 1992 ‘Rio Summit’ was held in Rio de Janeiro, as a result Agenda 21 was elaborated:
  - Strengthening legal frameworks for land management and land ownership
  - Access to land for the urban and rural poor
  - Efficient and accessible land markets
  - Establish appropriate forms of land tenure that provide security for all land users

Definitions

- Land is defined as an area of the surface of the earth together with the water, soil, rocks, minerals and hydrocarbons beneath or upon it and the air above it. (UN, 19985)
- Land Registration is a process of official recording of rights in land through deed or as title on properties.
- Cadastre (2D) is a methodically arranged public inventory of data concerning properties within a certain country of district, based on survey of their boundaries.
- It gives an answer to question ‘who’ and ‘how’
- Land administration provides the background information for structural change and transformation processes.
- It includes regulation and measure of
    - Land tenure
    - The use of land
    - The valuation of land
- Adequate land recording system consists;
    - A descriptive, alpha-numerical, textual part
    - A cartographic, numerical, geometric part

Contents of Land Recording



Contents and Relation Land Registration-Cadastre (Land Recording)

Land Registration and Cadastre

- **There are four principles in land registration:**

  –The booking or register principle – Change in real rights on property not legally effectuated until changes is registered on land book

  –The consent principle – the real entitled person on book must give his consent for change in land register

  –The principle of publicity – legal register are open for public inspection

  –The principle of specialty – in the land registers the concerned subject (man) and object (property) identified by short form

- **There exists two recognized system of land registration: The Deed and The Title**

  - The deed registration system means that the deed itself, being a document which describes an isolated transaction, is registered. The deed is evidence that a particular transaction took place, but it is not evidence of its legality. Deed registration concerns the registration of the legal fact itself and title registration the legal consequence of that fact.

  - The title registration means that not the deed, describing e.g. transfer of rights is registered but the legal consequence of that transaction i.e. the right itself (title). Title is evidence of a person's right to property. Title registration usually contains
    - The description of the property
    - The proprietor
    - The charges or encumbrances

Land Registration and Cadastre

Concerning the effect of land registration in case of title registration three principles upheld:

- The mirror principle – reflect correct legal situation
- The curtain principle – no further investigation beyond
- The insurance or grantee – for third party

Different categories of title registration exists in the world, which are mainly different in procedure **(The classification is largely geographical and tends to reflect difference in land law than land registration principle):**

- The English group (England, Ireland, Nigeria, some provenance in Canada) - large scale topographical ordinance survey map

- The Germany/Swiss group (Germany, Austria, Alsace-Lorraine, Switzerland, Egypt, Turkey, Sweden, Denmark) - parcel-based cadastral map

- The Torrens group (Australia, New Zealand, part of USA, Morocco, Tunis, Syria) - principle of incidental survey plan

Land Registration and Cadastre

- Cadastre is related to the principle of specialty as indicted before (Parcel number). Parcel can be defined as continuous area of land within which unique and homogeneous interests are recognized.

- There are two system of boundary demarcation
    - The general boundary – not entered on register
    - The fixed boundary - entered on register

- In case of general boundary the boundaries are, as far as possible, recognized on the ground but they are neither legally fixed nor permanently demarcated if this is not requested by the parties.

- In the case of fixed boundary the exact position of the boundaries is fixed on the ground in the presence of the parties

Land Registration and Cadastre

Land Registration and Cadastre is important for individual or citizen:

1. Documented evidence of ownership
2. Access mortgage loans with the help of documented evidence
3. The document ease dealing in land hence access to improved
4. Decrease title and boundary dispute

Land Registration and Cadastre is important for government

1. Establish an efficient and equitable system for justified levying of land or property tax
   - Fund for government for development
   - Encourage land owner of un utilized land to develop
   - Discourage land speculation
2. For implementation of land management (consolidation, land reform…)
3. To implement regulatory framework (land ceiling,
4. To locate and act on environmental problem sites
5. The cadastre map can be used for other necessary mapping
6. The cadastre system can be basis for LIS

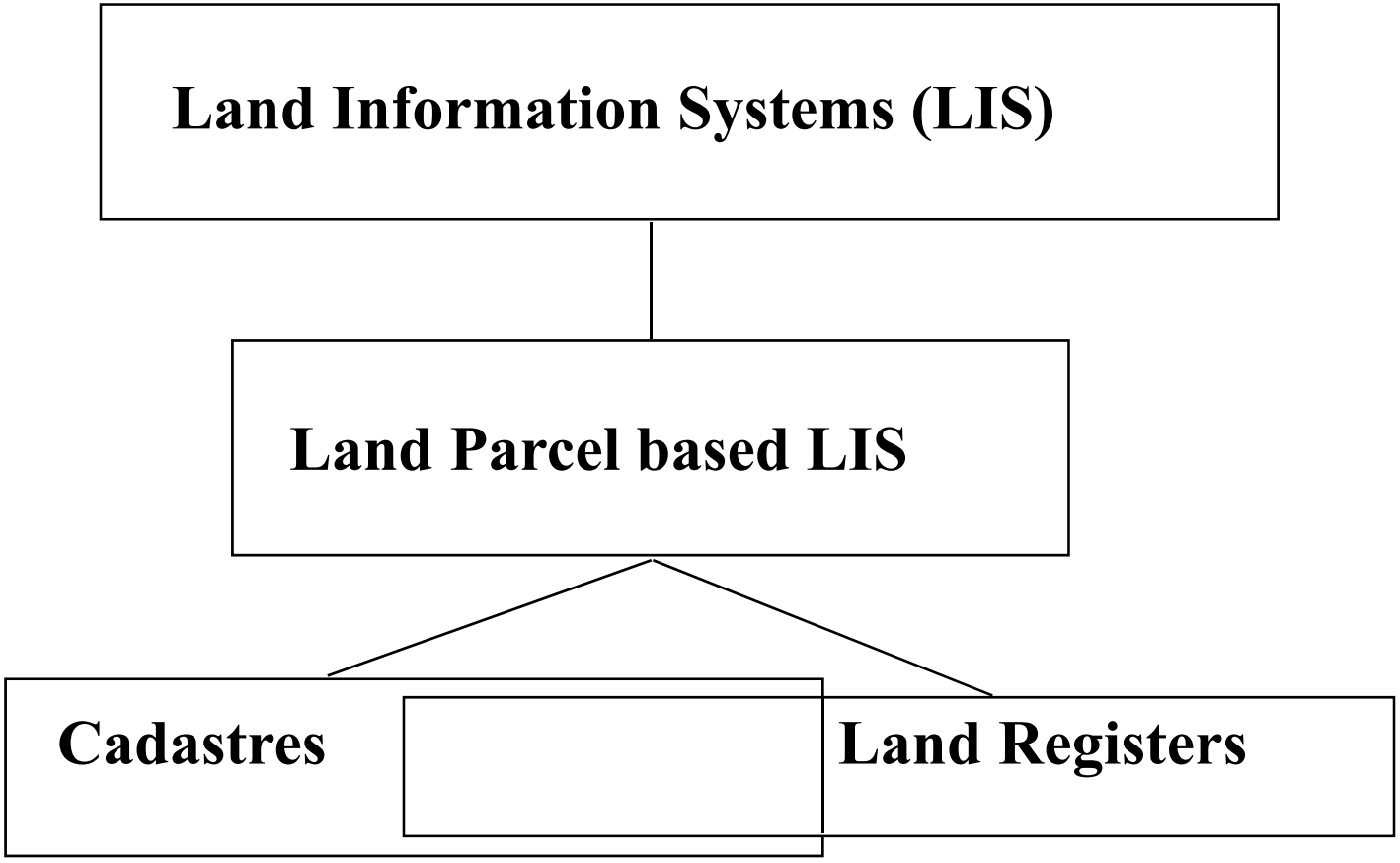
Land Registration and Cadastre

- A System for Recording Rights in Land
- Records include Text and Plans
- May NOT Cover ALL of a Country
- Includes:
  - Private Conveyancing
    (with or without Title Insurance)
  - Registration of Deeds
  - Registration of Title

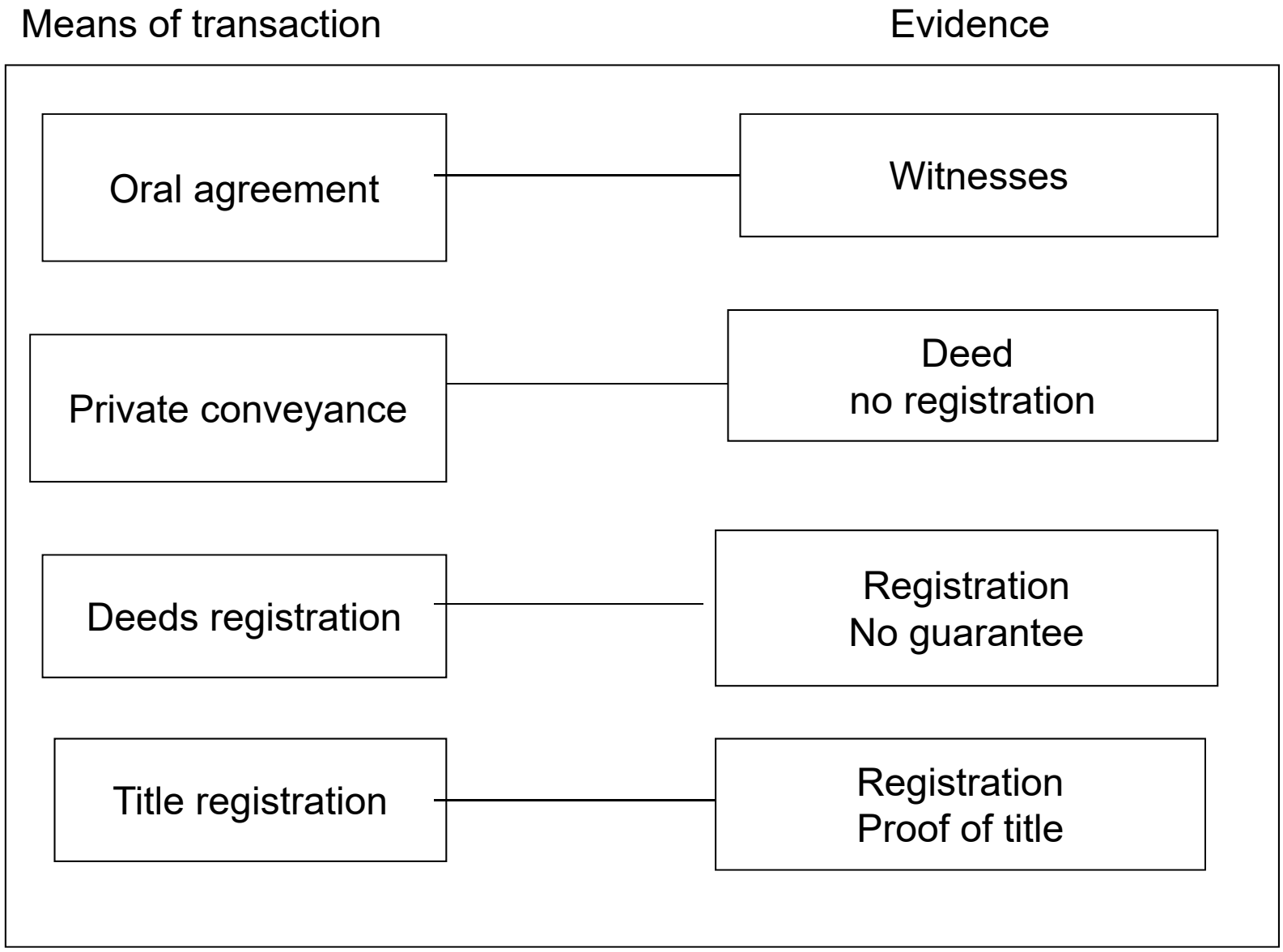
Records Information about Land Contains both Text and Maps
Is Used for:

- Recording Ownership
  (the Juridical Cadastre)
- Taxation
  (the Fiscal Cadastre)
- Land Management
  (the Multi-Purpose Cadastre)

Cadastres and Land Registers

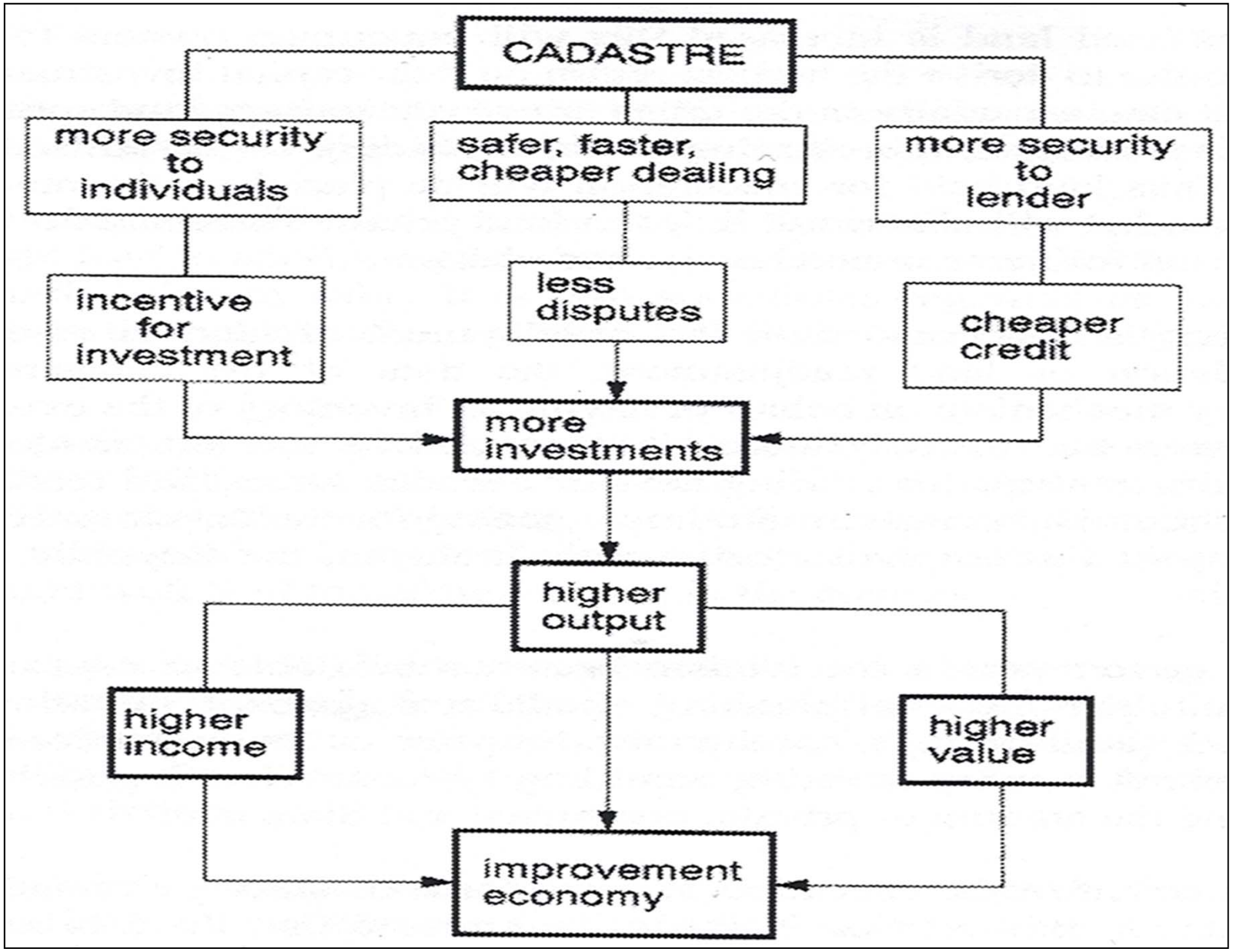


Types of transaction evidence



(Larsson, 1991)

Role of Cadastre and Registration for Individual



Multipurpose Cadastre

- **Cadastre system is evolved from fiscal to legal and to multipurpose cadastre or land information system**

- **Multipurpose cadastre contains a variety of information about the physical, legal, economic and social aspect of land.**

- **The appearance of electronic data enhances the use and effectiveness of the multi-purpose cadastre**

- **As a component of such multipurpose cadastre, the following can be considered:**
  - A geodetic network of coordinate points
  - A topographic large scale base map
  - A cadastre overlay with the parcel boundaries
  - The parcel number
  - The register or database to which data can be attached

- **Data that can be linked to parcel identifier are:**
  - Land right and restrictions
  - Land values and tax assessments
  - Rural and urban land use
  - Housing and building
  - Population and census
  - Administrative boundary
  - Monuments and antiques
  - Utility lines, etc

3D Cadastre

- Is a cadastre which registers and gives insight into rights and restrictions on 3D property unit.
- 3D property situation refers to situation in which different property units are located on top of each other.
- The growing interest for 3D cadastre registration is caused by;
  - Considerable increase in property values
  - The number of tunnel, cables and pipelines, underground parking places, building above road and railways and multilevel building are grown
  - an upcoming 3D approach in other domains (3d GIS, 3D planning)

Base Registration

- Base-registration eliminates the negative effects of multiple data collection, storage and dissemination
- It means that government bodies at all level use data collected by one of them avoiding the need for each to spend time and resource in collection
- With regard to the ‘border crossing’ development can be mentioned the EU INSPIRE project and EULIS project

INSPIRE

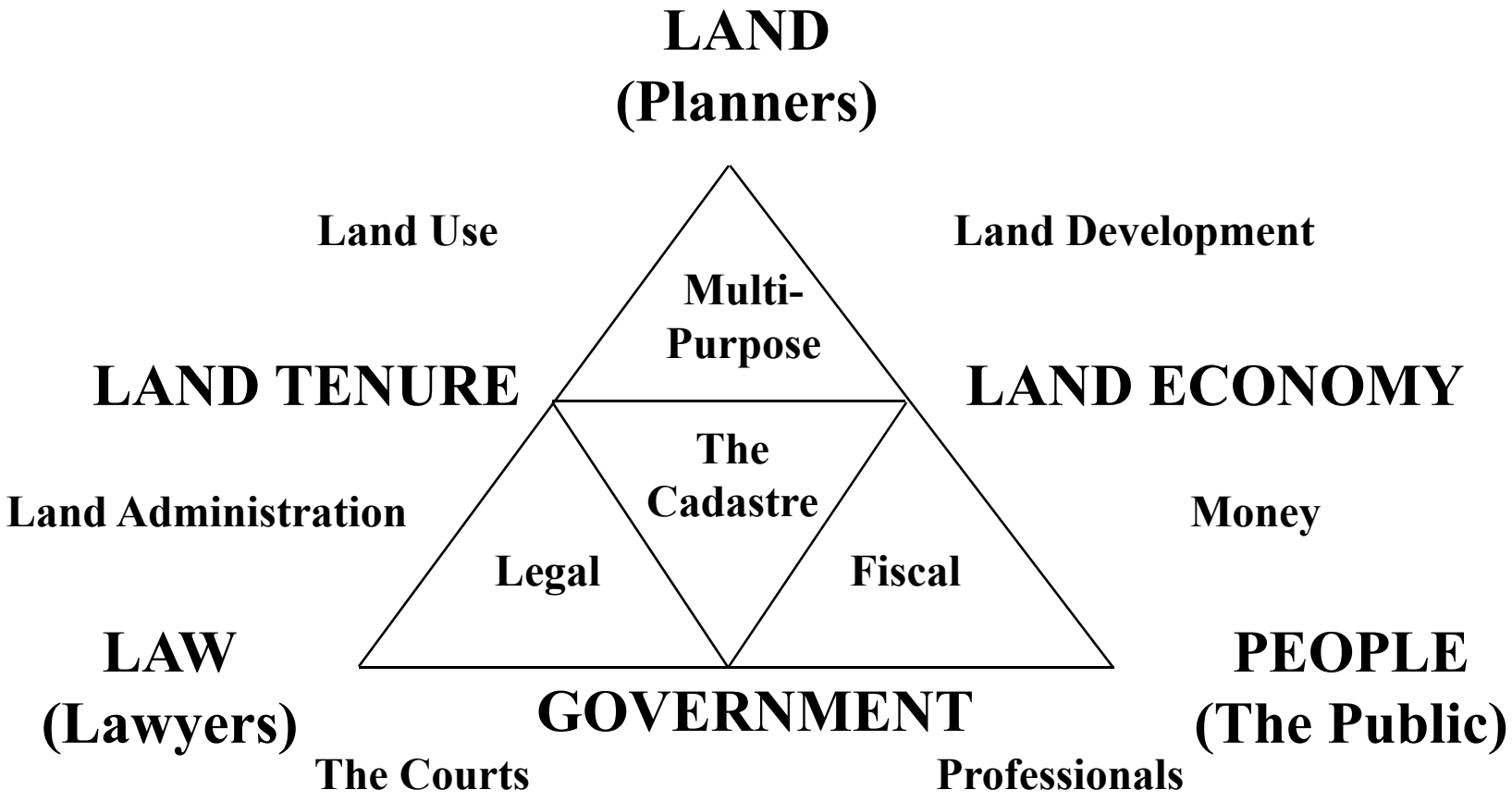
- INSPIRE (Infrastructure for Spatial Information in Europe) aim at making available, relevant, harmonized and quality geographic information for the purpose of formulation, implementation, monitoring of the community policy making

- Principle of INSPIRE
  - Data should be collected once and maintained at all level
  - Combine spatial data from different source and share it
  - Spatial data should be collected at one level of government and shared under all level

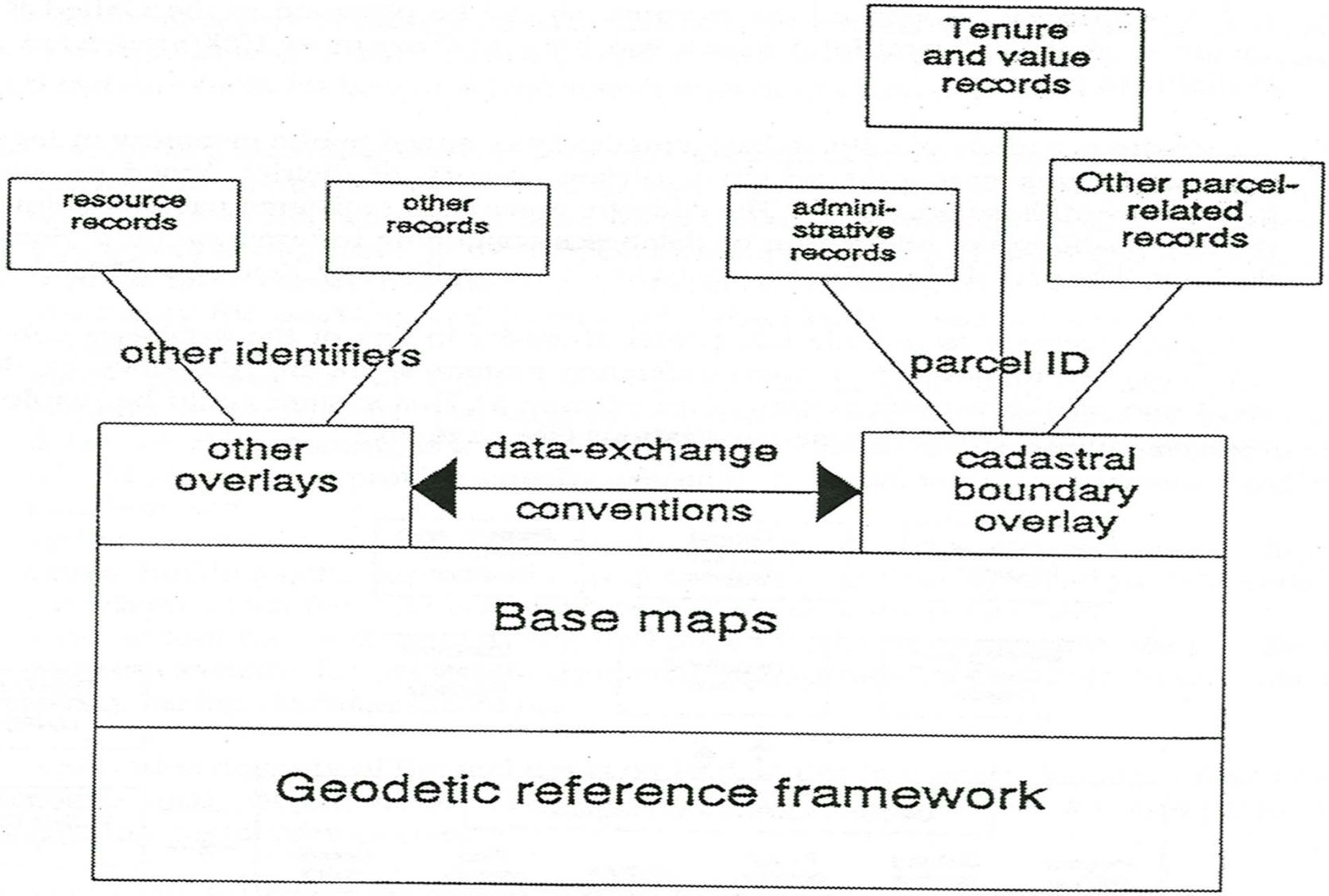
EULIS (European Land Information System)

- Is found agreement between 7 cadastre institutes of various European countries
- This project will enhance the accessibility cadastre information across Europe to promote single property market
- The vision of the future is that;
  - Customers will have ready access to information of individual properties throughout Europe
  - All European land registrations/cadastre will be readily accessible through a single portal

The Cadastral System



Components of Multipurpose Cadastre



Establishment, Maintenance, Renewal

- Two components of establishment:

  - Preparatory

  Determent the requirements of the beneficiary
  Review existing data
  Identify responsible institution
  Investigate influencing factors (geographical, legal, social, political, financial and economic factor)
  Development of legislation framework
  Develop training program

  - Operational

  Adjudication – the process of investigating the existing right in land for recording purpose
  Demarcation – Physical marking of boundaries
  Surveying -
  Recording – entry in the descriptive part and the mapping part of the cadastre

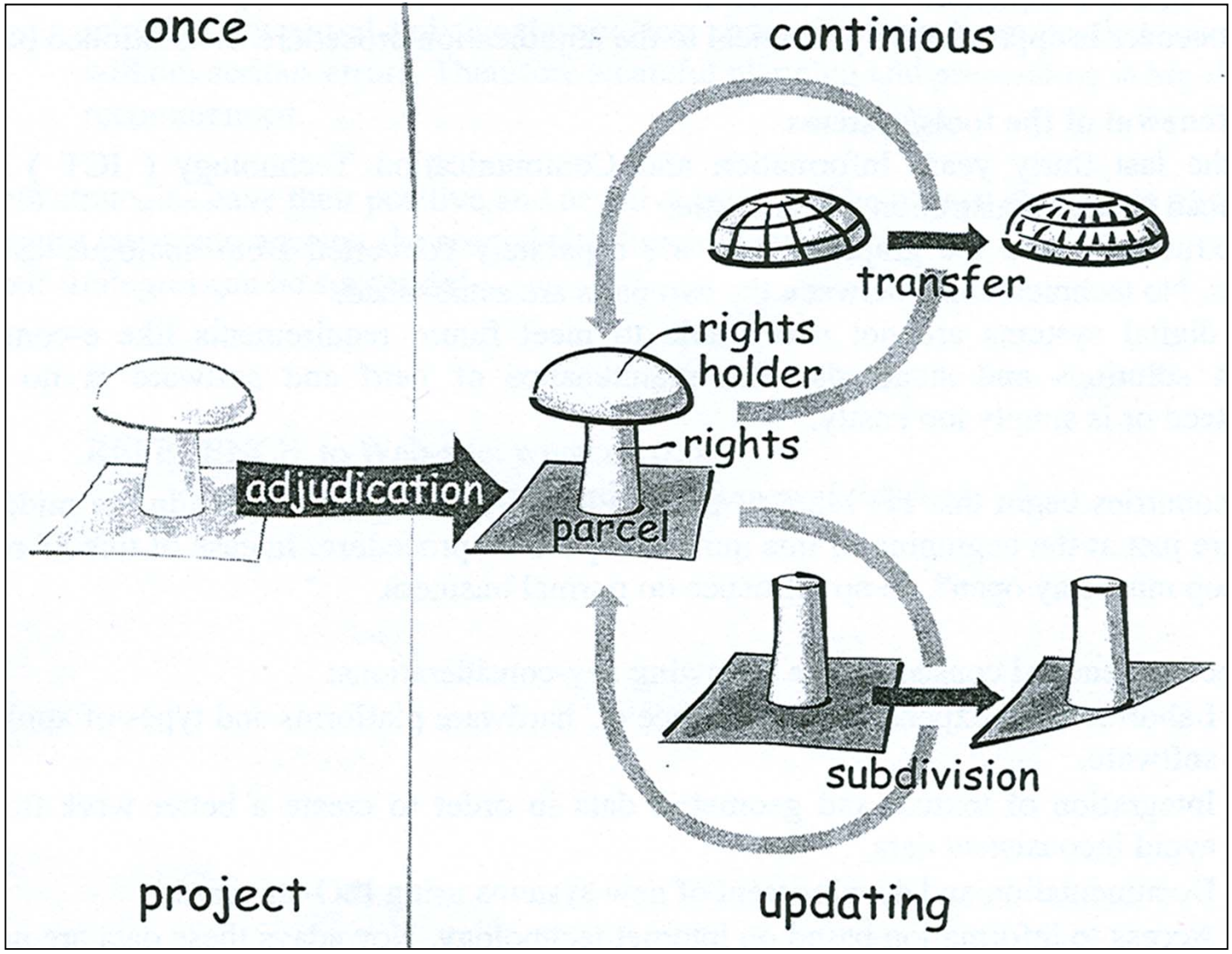
- Maintenance encourage citizen for maintenance through:

  Reduction of registration fees, Simplify the writing of the deed, Decrease the travel distance of applicants, Change in ownership should only be reported to one office, The register should be informed by courts, notaries, local authorities, Registration should be conclusive evidence of transfer, Close co-operation between institutions concerned

- Renewal

It refers to both the textual part (register) and the geometric part (cadastre). Renewal can be:

a) renewal of the content –change in ownership or size due to different reasons
b) renewal of the tool/systems – development of IT



Dynamic model of the system of land registration (Zevenbergen, 2002)

Progressive Cadastre, Legislation

- The four categories of cadastre;
    - The fiscal cadastre – for property valuation and taxation
    - Legal cadastre – for land tenure recording
    - Multipurpose cadastre -
    - Progressive/half-way/grass-root/flexible cadastre

- Progressive cadastre is cadastre especially designed for rapid application and carried out at lowest possible cost per unit

- It is characterized by rapid application, low cost, technically and administratively simple, adaptable to modernization, earlier work not useless and step by step approach

- It will be necessary to lay down peremptory and clear rules binding all parties

- Legal regulations should indicate;
    - Genera; provisions with definitions
    - Contents of land register and cadastre
    - Institution responsible
    - How and when updating effected
    - How recoding can be rejected
    - Organization of information supply and exchange
    - The data protection

Data Protection, Accuracy, Criteria for Success

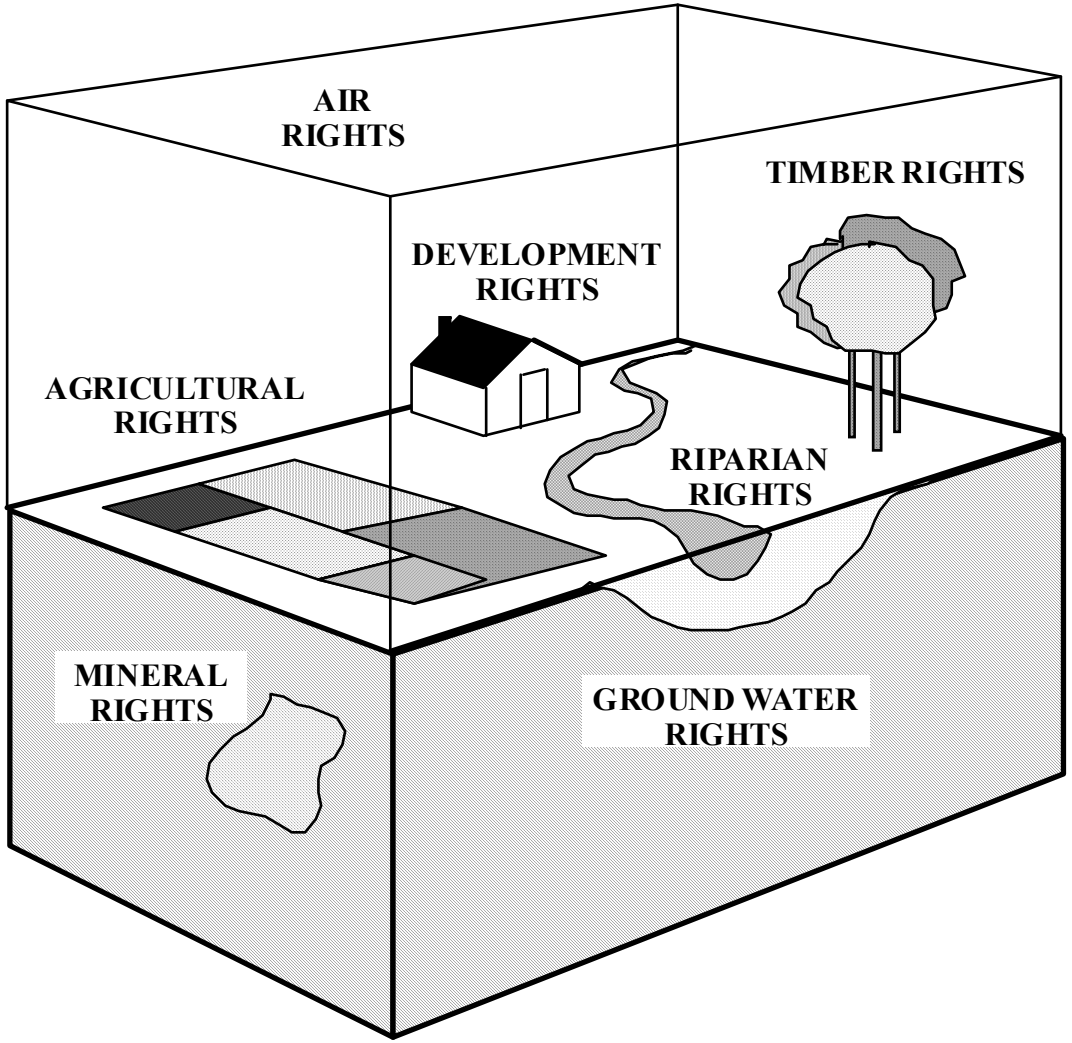
- It concerns the safety, security and integrity of the stored data

- The two elements of data protection are;
  - The physical safeguarding of data – safeguarding against loss by acts of nature, deliberately by man and unauthorized use or alteration
  - Protection of the personal privacy of the individual

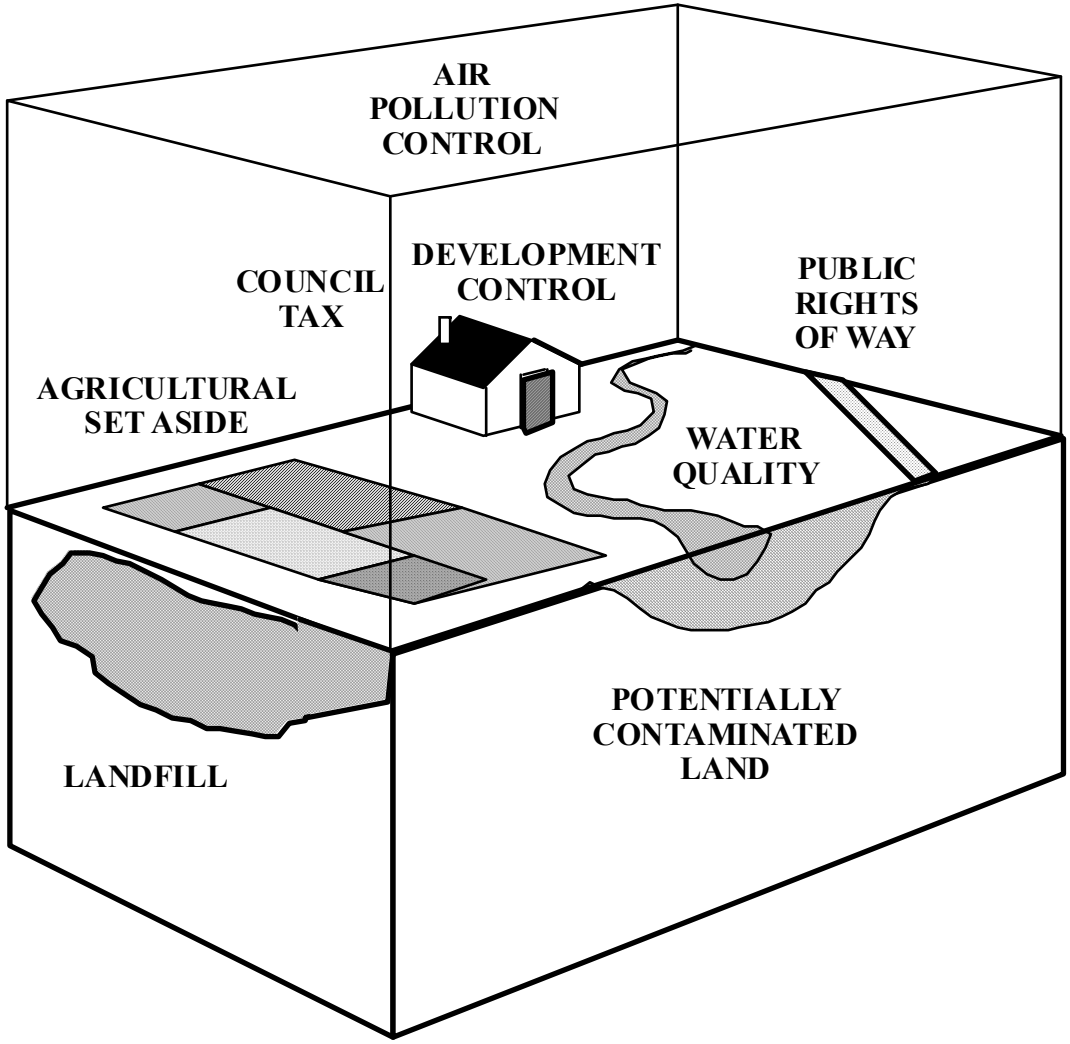
- Accuracy is closeness of observations to accepted true values
- Precision and reliability are elements of accuracy
- Accuracy contains
  - Positional – geographic position (co-ordinate, boundary, mapping)
  - Thematic – issue like legal status, value, use of land, tenure aspect
  - Temporal – time aspect in the gathered data

- Security – the system should be secure that a land market can operate
- Timeliness – up-to-date information timely
- Fairness – equitable access
- Accessibility – access to all user
- Clarity and Simplicity, Cost, Sustainability

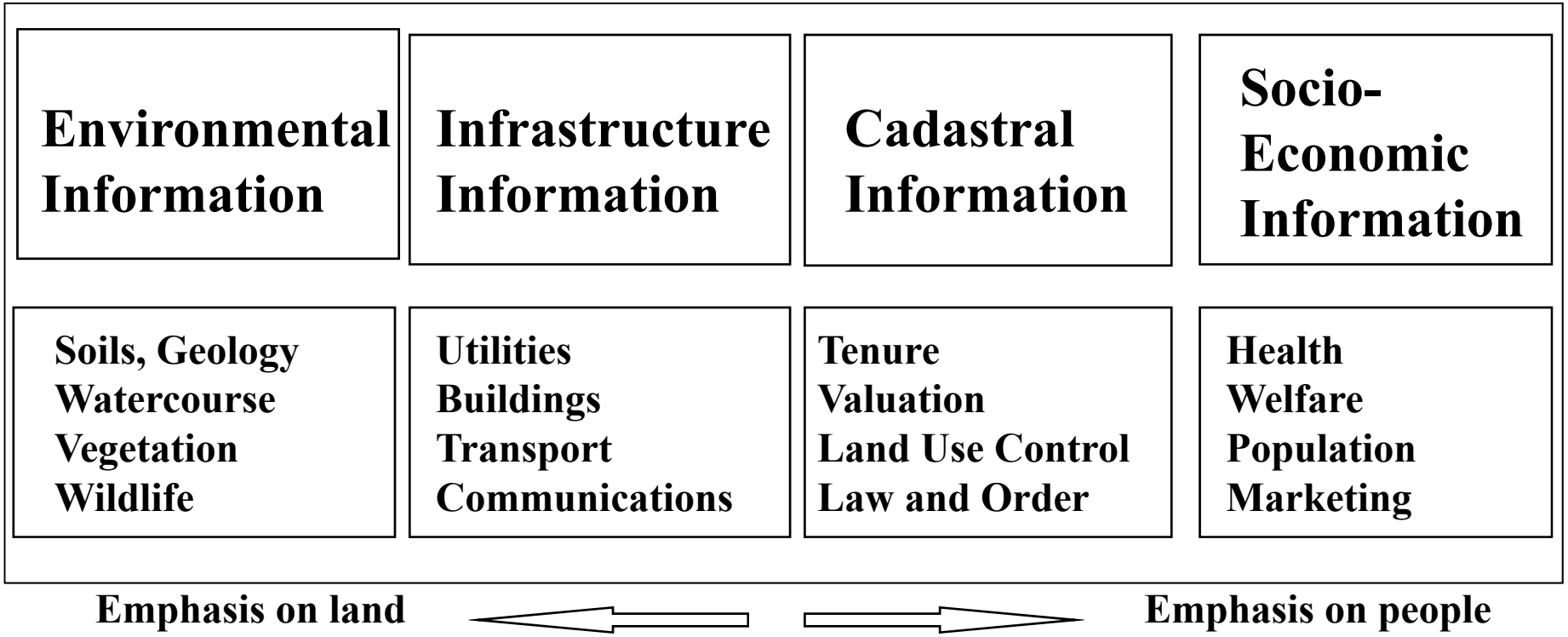
Real Property Rights



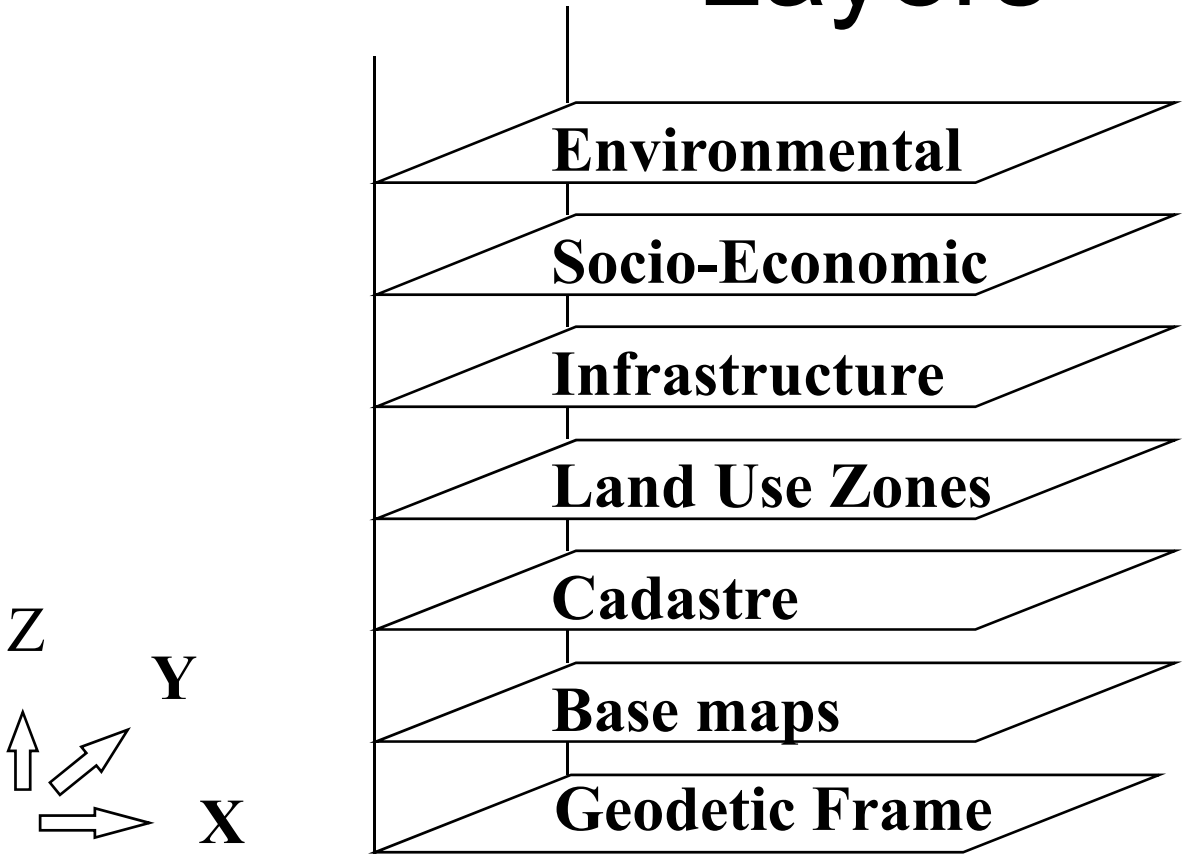
Land Use Controls



Land and Geographic Data

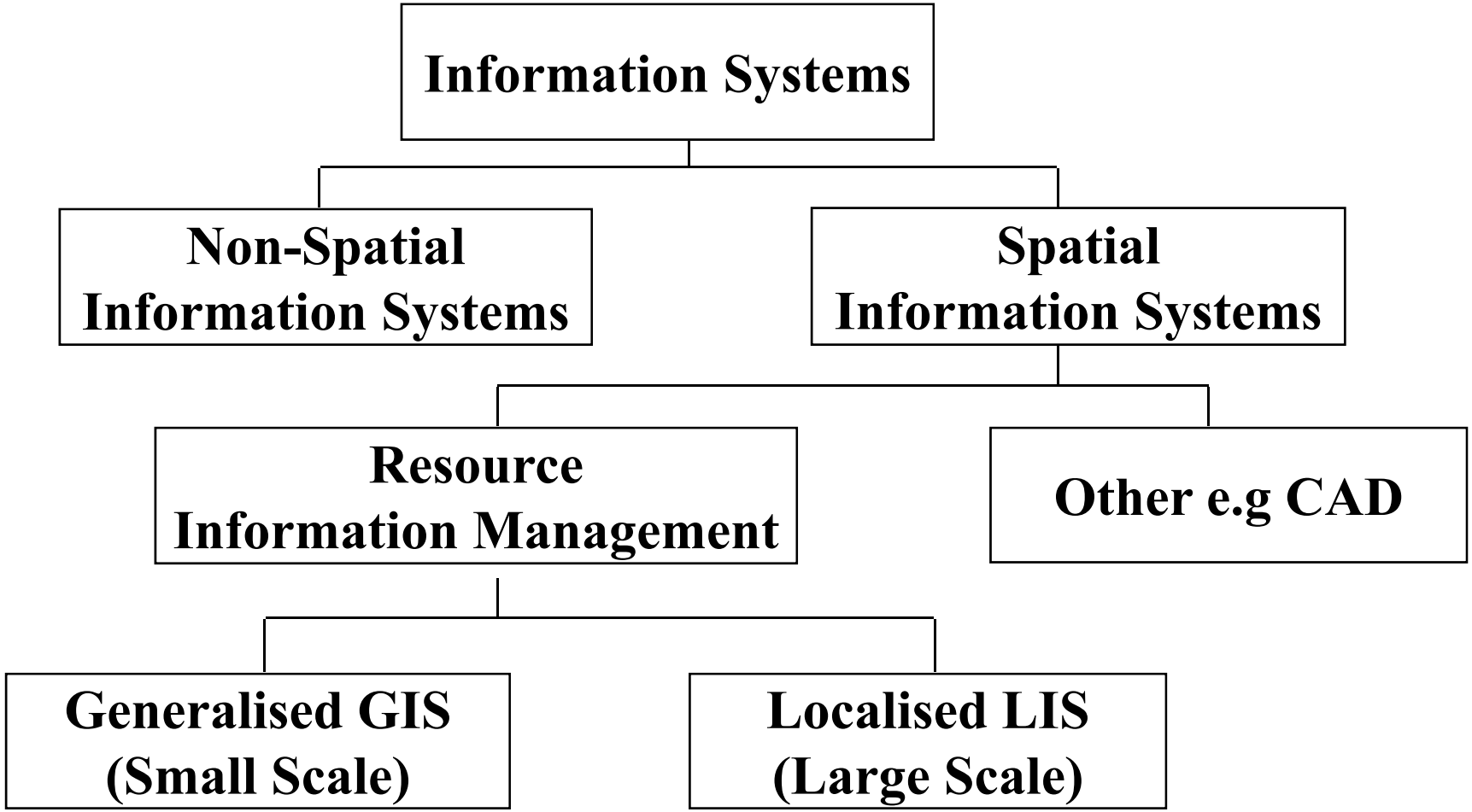


Land Information Layers



linked by
x,y,z
and
Unique Parcel Reference Number (UPRN)

Information Systems Taxonomy



Spatial Information Systems, Geographic Information Systems (GIS)

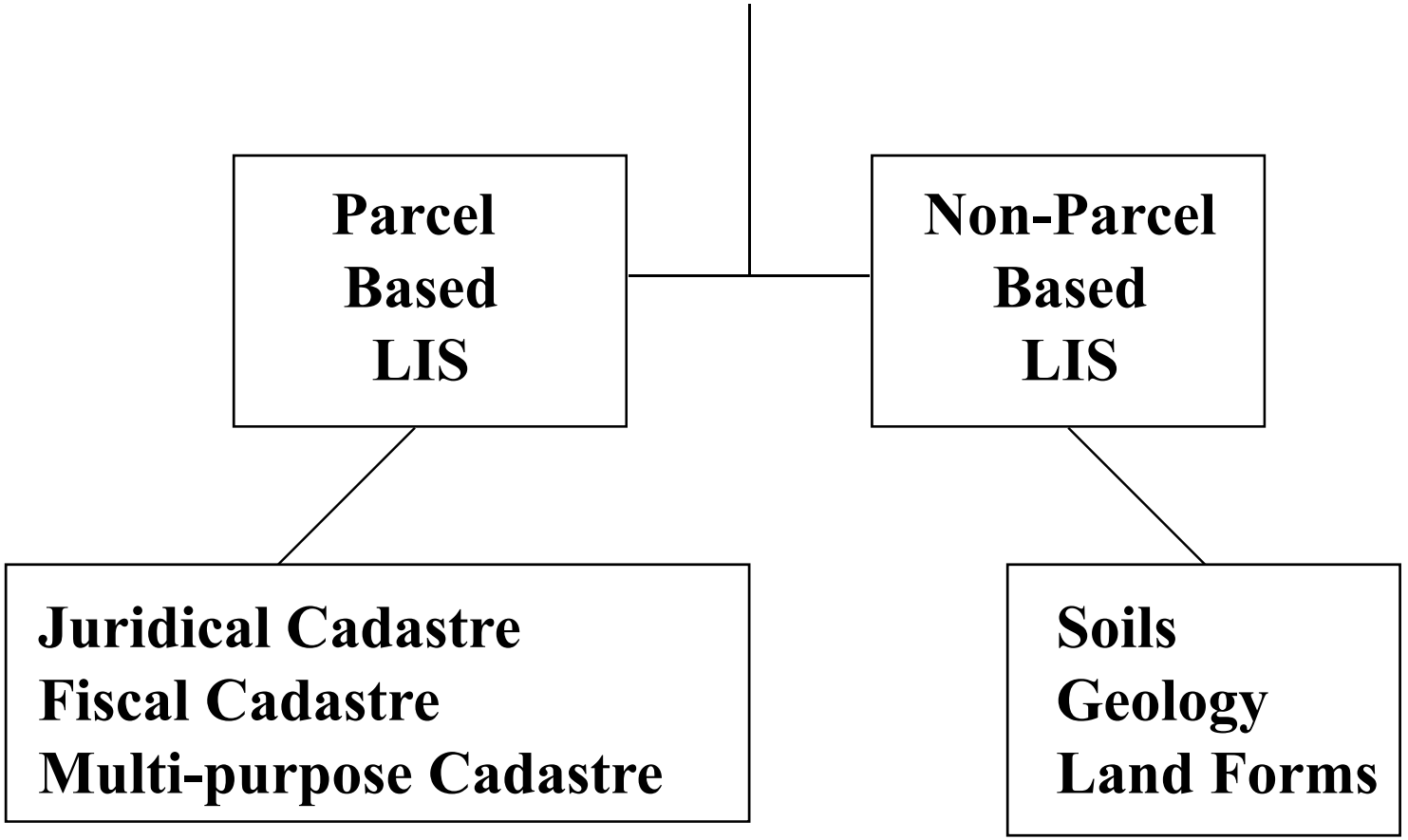
1. Cadastral Information Systems
2. Geographically Referenced Information Systems
3. Land Data Systems
4. Land Information Systems
5. Market Analysis Information Systems
6. Multipurpose Cadastre Systems
7. Natural Resource Management Information Systems
8. Planning Information Systems
9. Property Information Systems
10. Soil Information Systems
11. Spatial Decision Support Systems
12. Urban Information Systems

GIS Functionality

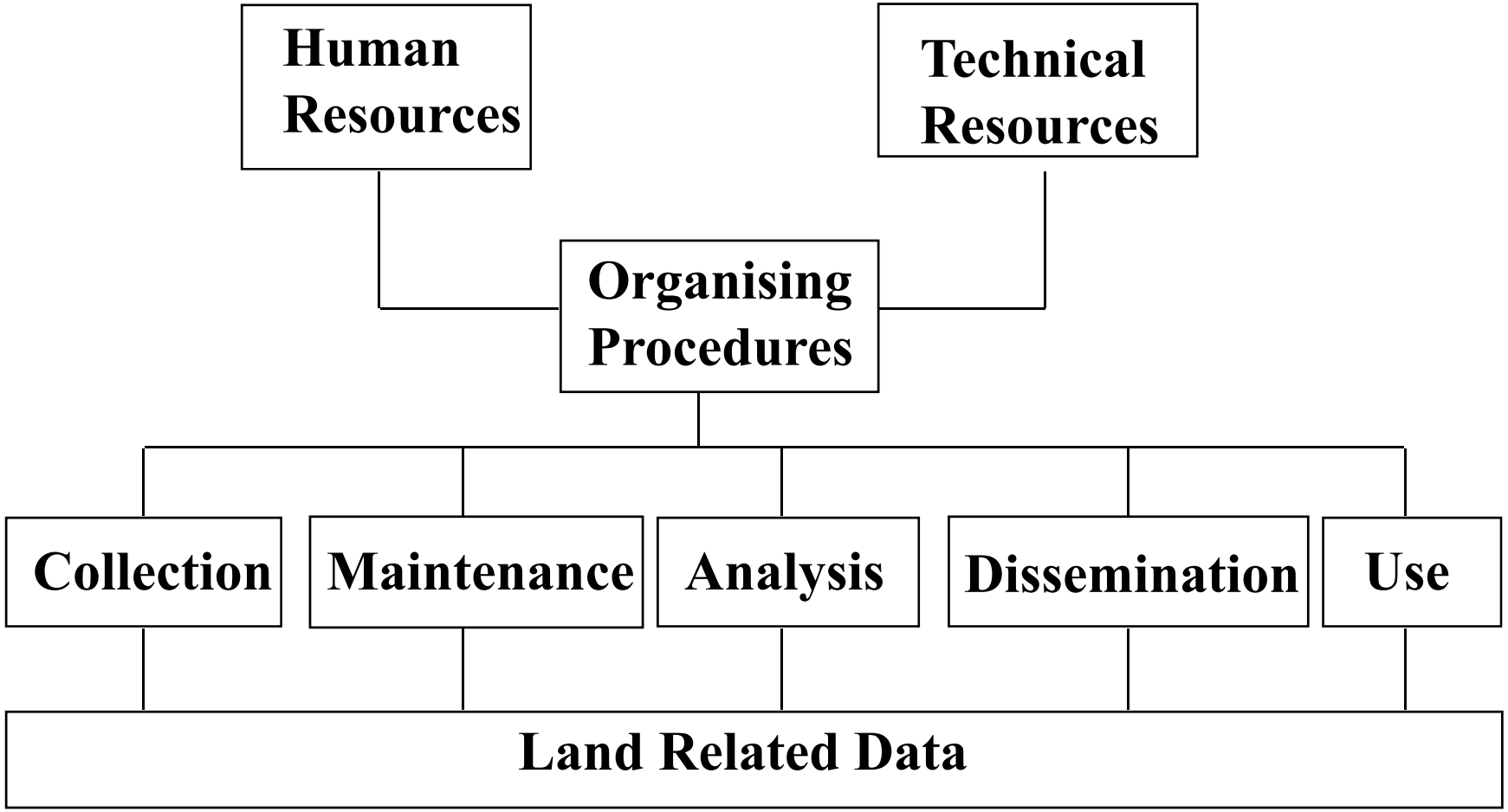
What can be found at point X?
What can be found within area Y?
Where can Z be found?
What has changed since time T?
Which is the best way from A to Z?
What pattern best fits these events?
Is Plan A better than Plan B?

Capture,
Checking,
Storage,
Integration,
Manipulation,
Analysis,
Display of Spatial Data

Land Information Systems



Land Parcel Information Systems

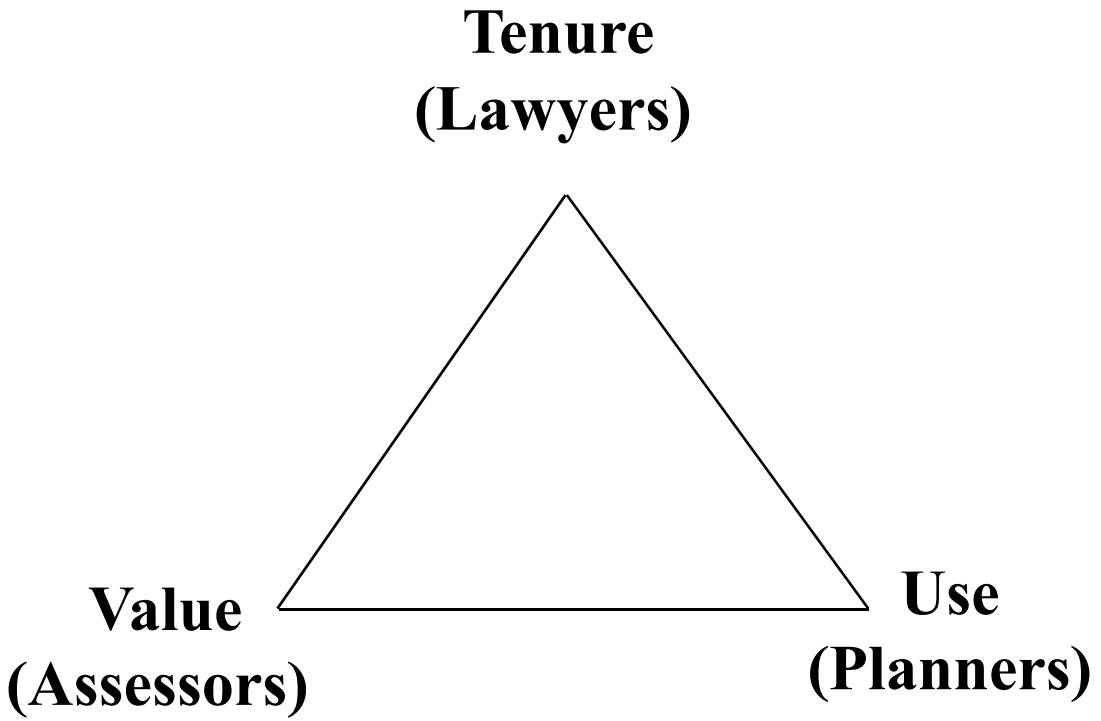


Land Information Management (LIM)

1. Land is a fundamental resource that must be properly managed to achieve sustainable development.
2. Good land information is an essential part of good land management.
3. The costs of mismanagement are often not quantifiable but are nonetheless real.
4. The proper management of information about the tenure, value and use of land saves resources and can create wealth.

Attributes and Importance of Land

- **Physical**
- **Legal**
- **Cultural**
- **Economic**



Property Ownership, Land and Property Values, Land Use

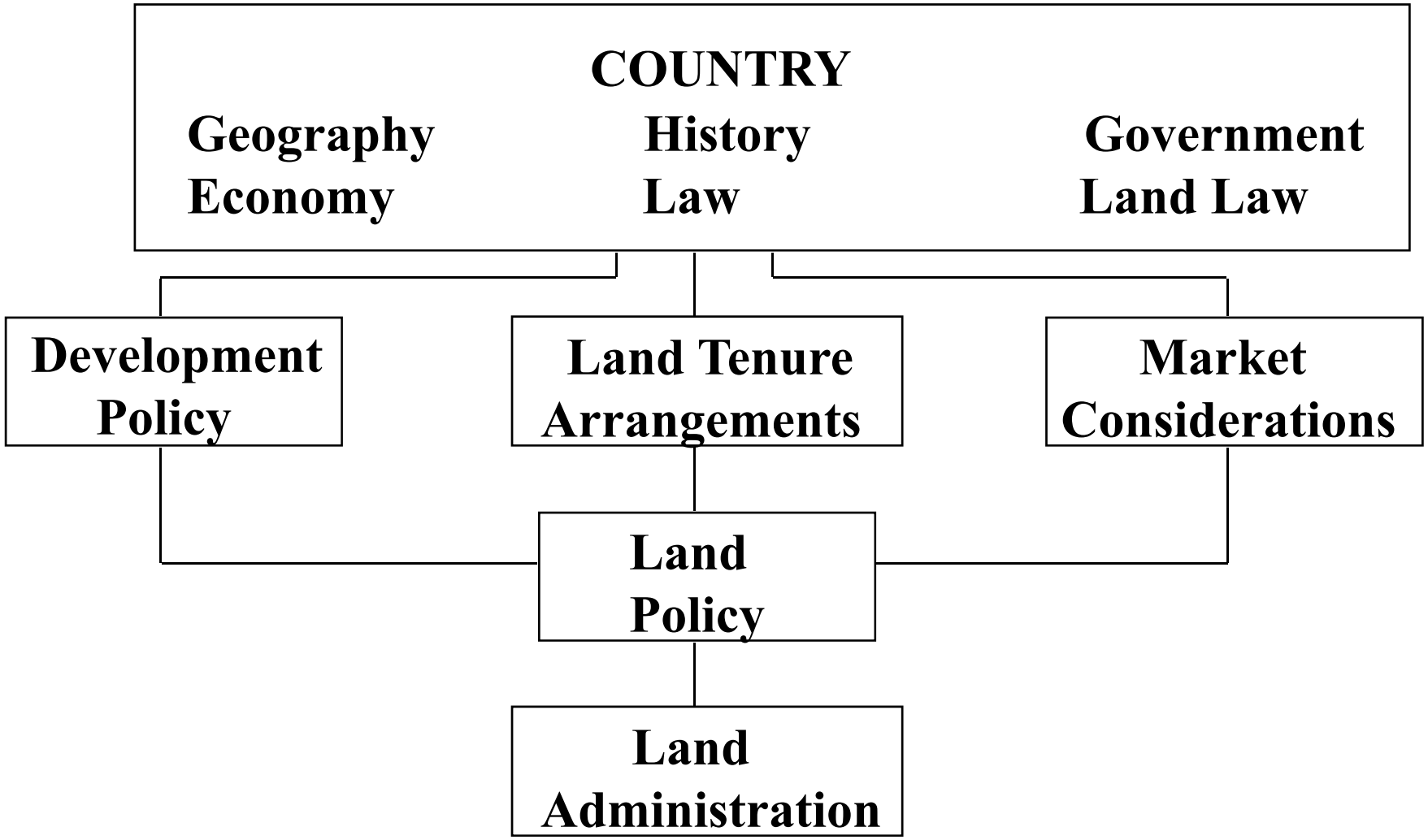
- Who owns it?
- Who can dispose of it?
- Who can acquire it?
- Who can use it?
- Who can change it?
- Who can stop it being changed?
- Who can profit from it?
- Who have third party interests?

- Market (sales) values
- Rental values
- Construction costs
- Site potential values
- Taxable values

Land Use

Land Use is the interaction between land rights and land management. It includes the activities that human beings undertake upon the land and the rights that are associated with the land. It also includes what is physically on the land.

Land Administration



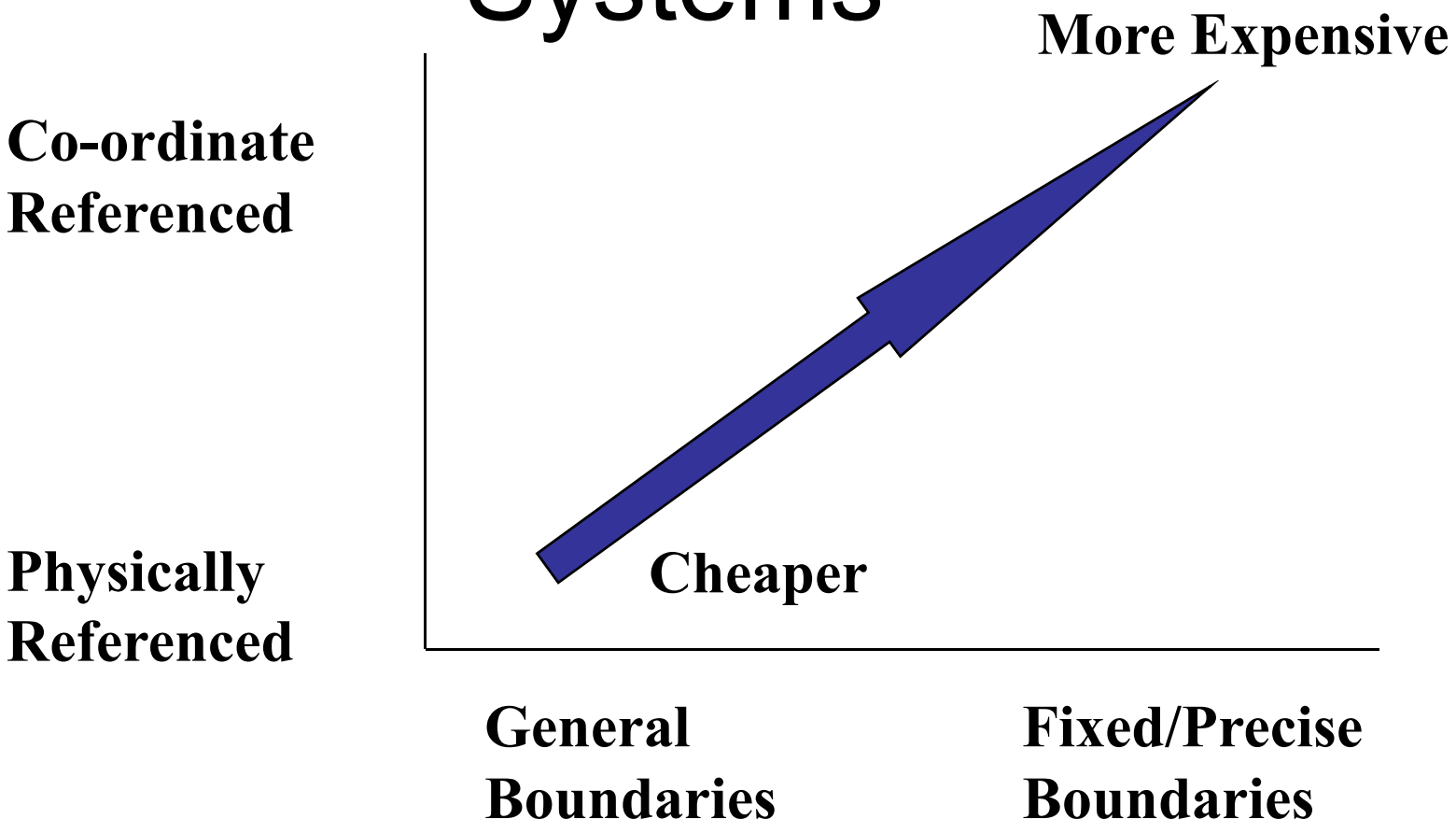
Cadastral Surveys and Its Options/Issues

- Original Surveys
- Sub-divisional Surveys
- Land Assembly
- Land Re-allocation
- Boundary
- Retracement
- Field Survey
  - Low Technology
    - Chain Survey
    - Plane Table
    - Theodolite and Tape
  - High Technology
    - Total Station / Theodolite and EDM
    - Satellite Positioning Systems
- Photogrammetric Surveys

- Accuracy v Precision
- Cost
- User Requirements
- Parcel Definitions
- Parcel Identifiers
- Quality Control
- Public Sector v Private Sector
- PPP - Public Private Partnerships

- Simple Aerial Photographs
- Rectified Photographs
- Orthophotographs
- Analogue Plotting
- Analytical Plotting

Survey Systems



Public Versus Private Sector

- Land Settlement : mainly Public Sector
- Land Survey: often Private (Licensed) Surveyors
- Land Registration: usually Public Sector
- Land Use Control: Public Sector
- Infrastructure: increasingly Private Sector
- Public Sector generally provides

- Geodetic control
- Mapping for national security
- National topographic mapping
- General national cadastral map cover
- Quality control for the private sector
- Research and development
- Surveying and Mapping for large projects

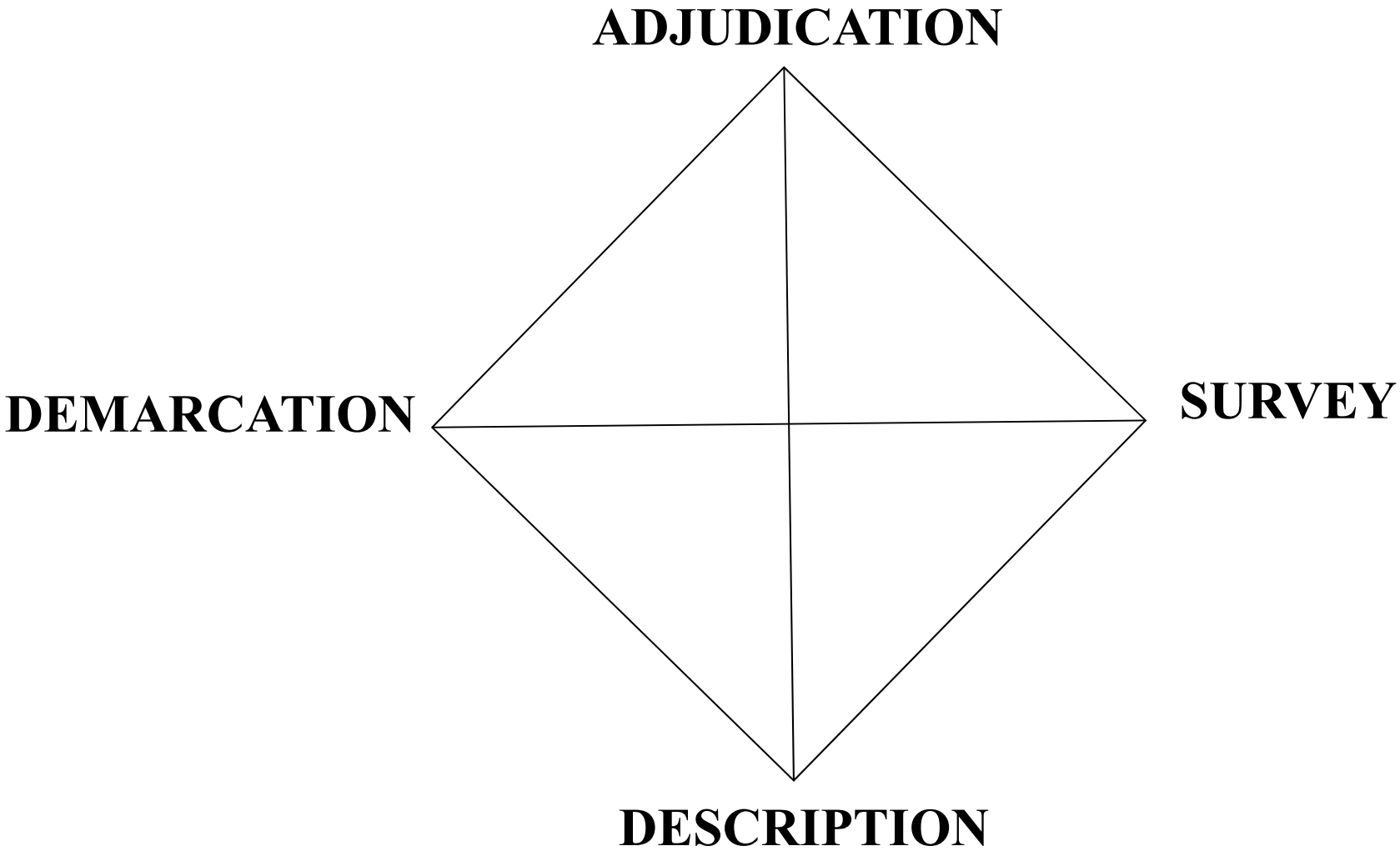
Public Sector:

- Has many traditional skills but is conventional hence is reluctant to take risks
- Well equipped but often over staffed and hence not cost-effective
- Addresses national interests but is poor in small markets
- Accountable to government but responds slowly to market pressures

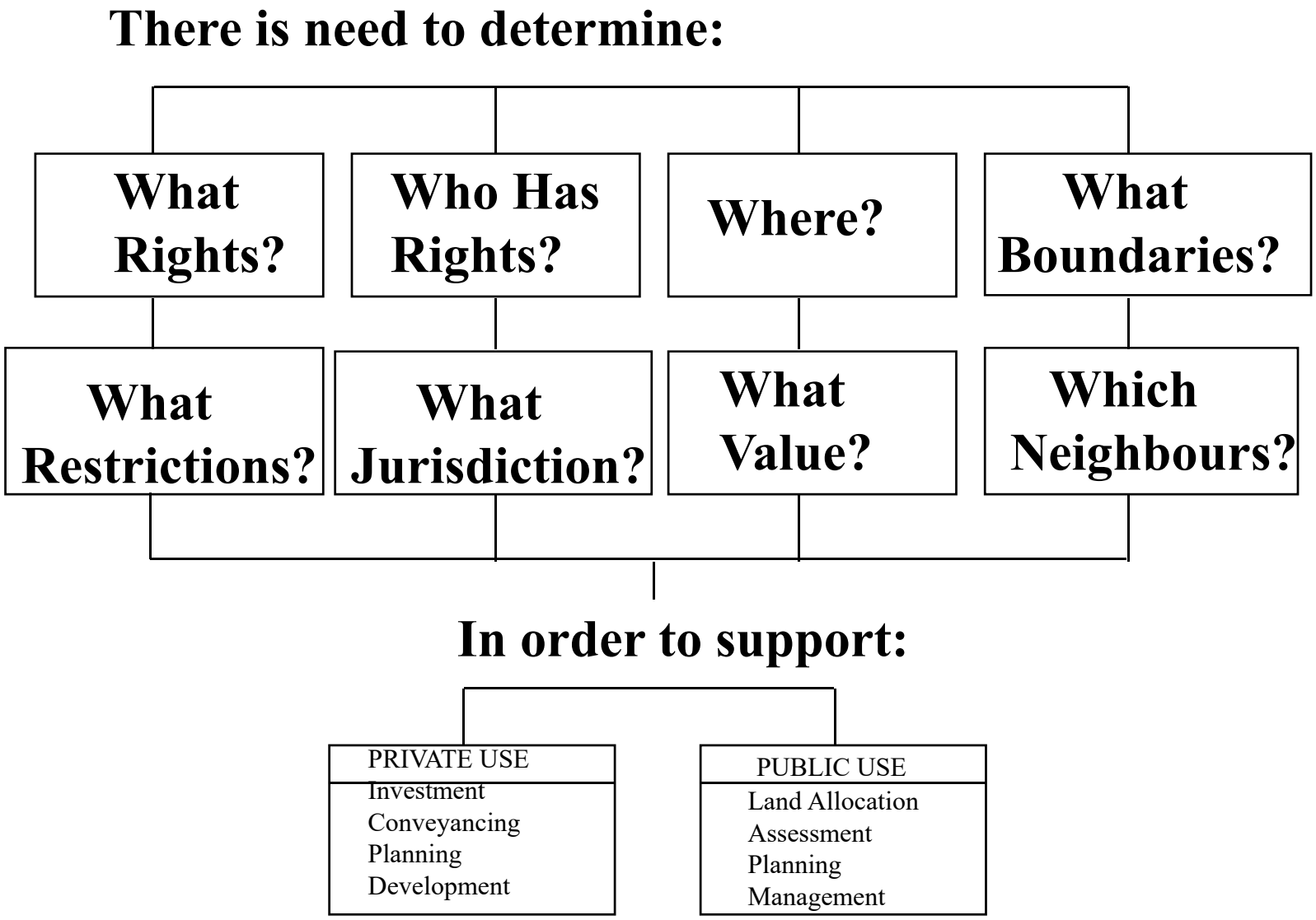
Private Sector:

- Innovative and responsive to market forces
- Flexible but takes risks
- Reluctant to make longer term investments
- Concerned with short term profitability
- Accountable only to the client and/or professional body
- Requires quality control

Cadastral Operations



Land Tenure Information



Adjudication

The Official Determination of Rights in Land

The process may be:

- Compulsory
- Conducive, or
- Voluntary
- Sporadic, or
- Systematic

SPORADIC

- Less Capital Intensive
- Costs directed at Beneficiaries
- Selective

SYSTEMATIC

Publicity
On-the-Ground
Easy to Administer
Cheaper Surveys
Lower Unit Costs
Links to Land Reform

Adjudication Procedures

- Promulgate Law

- Select areas of priority, depending on
  - Litigation
  - Need for Development
  - Need for Credit
  - Land Reallocation
  - Land Taxation
  - Political Benefit

- Publicise Actions

- Appoint Officers
- Select Adjudication Team
  - Adjudicator
  - Demarcation Officer
  - Surveyor
  - Recorder
- Carry out Adjudication
- Publicise Results
- Provide for Appeals
- Register Titles

Evidence of Title

- Title Deeds
- Witnesses
- Public Documents
- Ancient Documents and Church Records
- Official Surveys and other Maps
- Declarations of the Deceased
- Acts of Ownership and Modes of Construction
- Local Custom

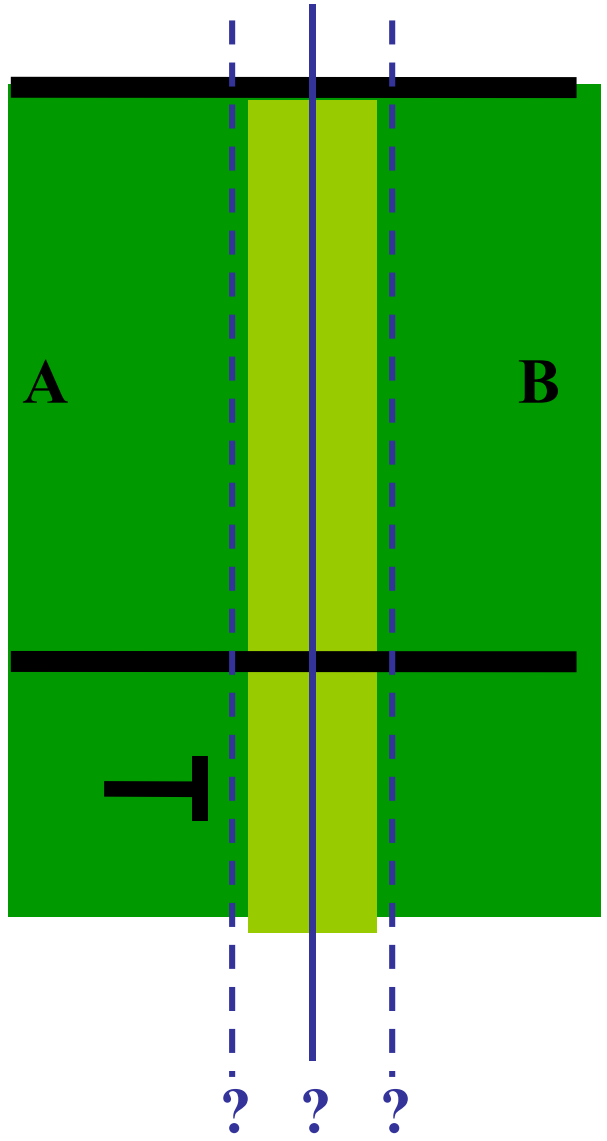
Boundaries

FIXED/PRECISE

- by Marks not by Measurement
- by Plans not by Pegs
- by Precise Surveys

GENERAL

- Undetermined
- Indefinite
- Approximate



Boundary Changes

- by natural processes
- by agreement
- by adverse possession
- by estoppels
- by rectification
- by registration
- by ruling of the Courts
- by decree

Parcel References

- Grantor/Grantee Index (names of parties)
- Volume and Folio (Vol. 989 / Folio 60)
- Block and Plot Number (Block 84, Plot 16)
- Post Office Address (5, The Avenue, Bath)
- Post Code (KA26 9TX)
- Title Number (WX88653)
- Street Index and Address (555554444A333)
- Valuation Office Reference Number
- Unique Parcel Reference Number
- Grid Co-ordinate or Geocode

Feasibility Study

Prior to taking any decision on cadastre/land registration system feasibility study should be conducted:

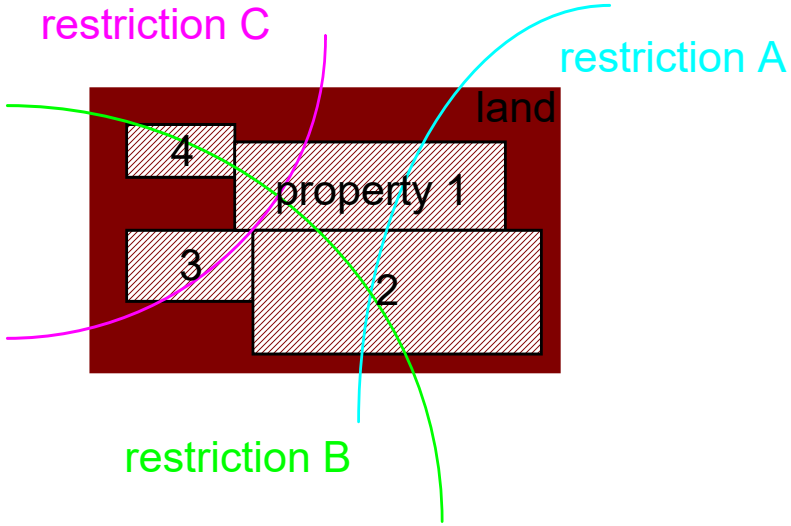
1. Investigation if exiting conditions
    - Existing land record and maps
    - Existing tenure and legal structure
    - Available resources
2. Existing problems and the benefits of the new system
3. Pilot studies Cost estimates
5. Definition of principal goals
6. Choice of principal method
    - Voluntary (sporadic)
    - Compulsory (sporadic)
    - Compulsory (systemic)
7. Priorities and selection of areas
8. Definition of legal measures, legal power of land registration

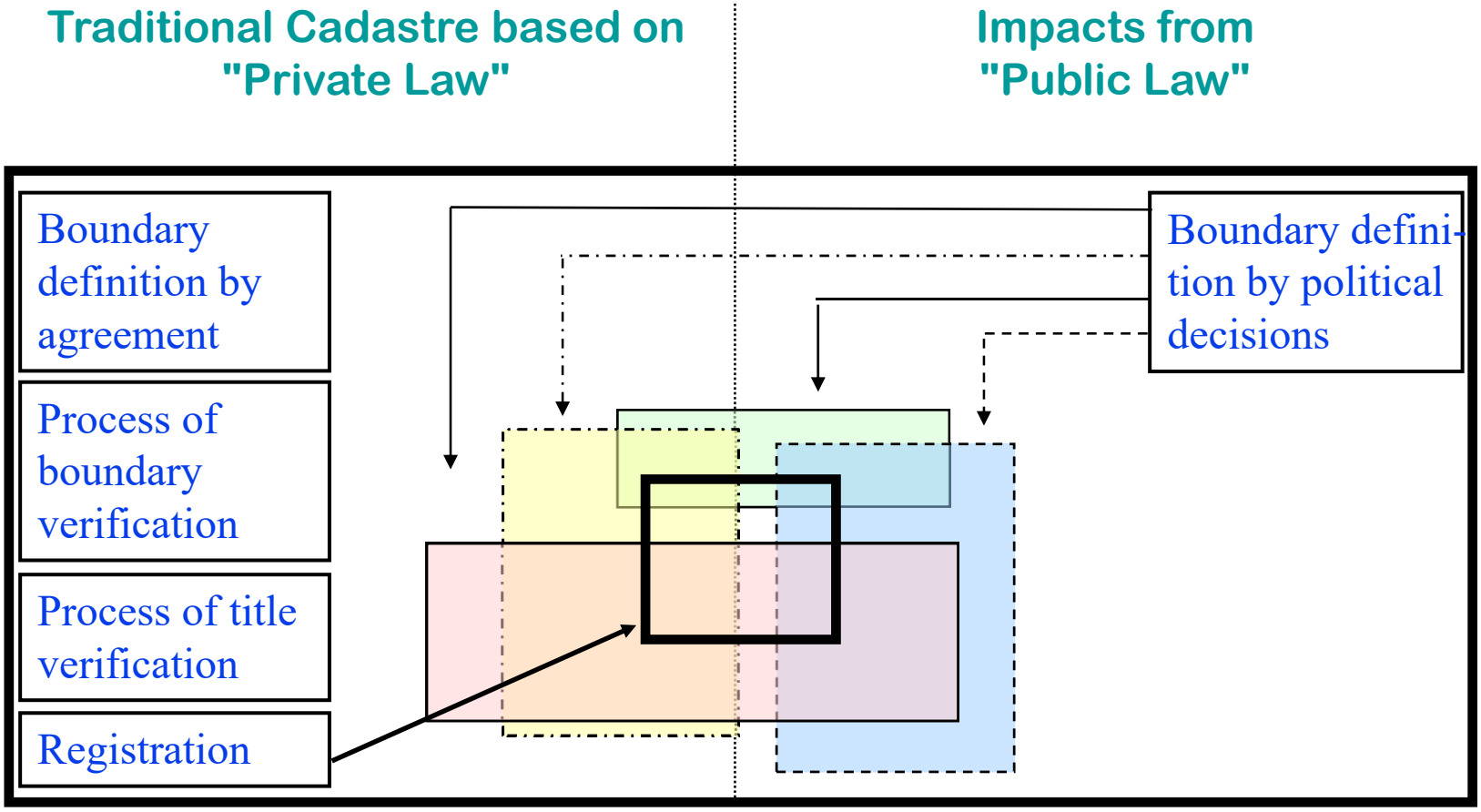
Cadastre 2014

- Result of 4 years of work (1994-98)
- 4 annual meetings
- 40 working group members from 26 countries
- Organization of a one-day seminar on ‘Modern Cadastres and Cadastral Innovations’
- Questionnaire for Trend Analysis (32 responses)
- Questionnaire about Cost Recovery and Privatization Aspects (51 responses)
- Paper on ‘Benchmarking’
- the presentation of the statements here is very simplistic

Trend Analysis

- Cadastre only shows private law matters; restrictions from public law are not shown and are not transparent to land market.



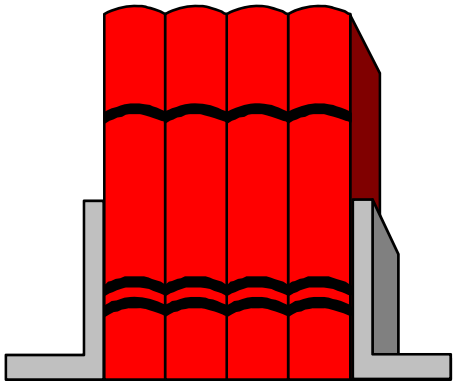


100–120%

Legal Security

Trend Analysis

- Link between ‘map’ and ‘register’ is not efficient enough.
- Trend towards digital data format.
- Trend towards data automation and computerization.
- Trend towards privatization, especially in the level of operational control.



Traditional Definition

Land Parcel

A land parcel is a piece of land with defined boundaries, on which a property right of an individual person or a legal entity applies.

Definition of Cadastre 2014

Land Object

A land object is a piece of land in which homogeneous conditions exit within its outlines. The legal land objects are described by the legal content of a right or restriction and the boundaries which demarcate where the right or restriction applies.

The coming into being of a Land Object

Process:

A law defines the contents of rights or restrictions

According to the law, the outlines of the effect of the right or restriction is defined (usually on a map)

Impact area of right or restriction

Example:

The right to own land is defined by the land code

The piece of land, where the right of an owner is in effect is fixed by an agreement between owners

Defined area of the ownership

Traditional Definition

Cadastre

Cadastre is a methodically ar-
ranged public inventory of data
concerning **properties** within a
certain country or district, based
on a survey of their boundaries.

Definition of Cadastre 2014

Cadastre 2014

Cadastre 2014 is a methodically
arranged public inventory of data
concerning all **legal land objects**
in a certain country or district,
based on a survey of their bounda
-ries

Principles of the Traditional Cadastre

Cadastre
and Land Registration

Booking principle
Consent principle
Principle of publicity
Principle ofs peciality

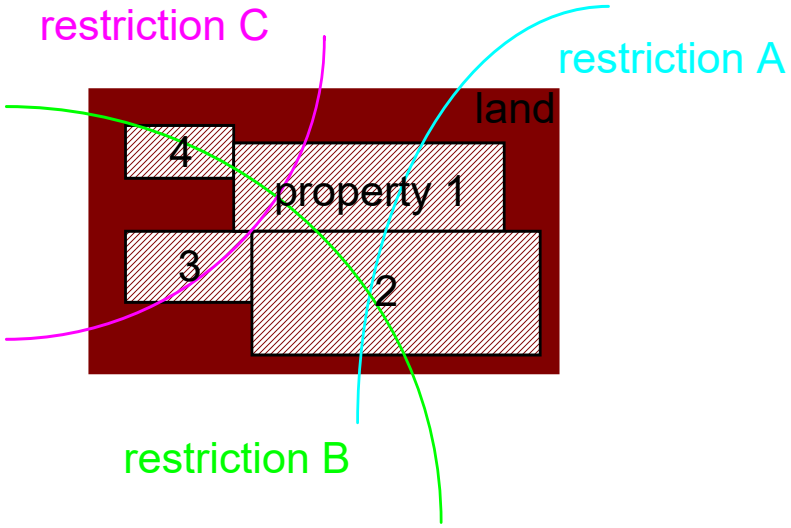
Definition of Cadastre 2014

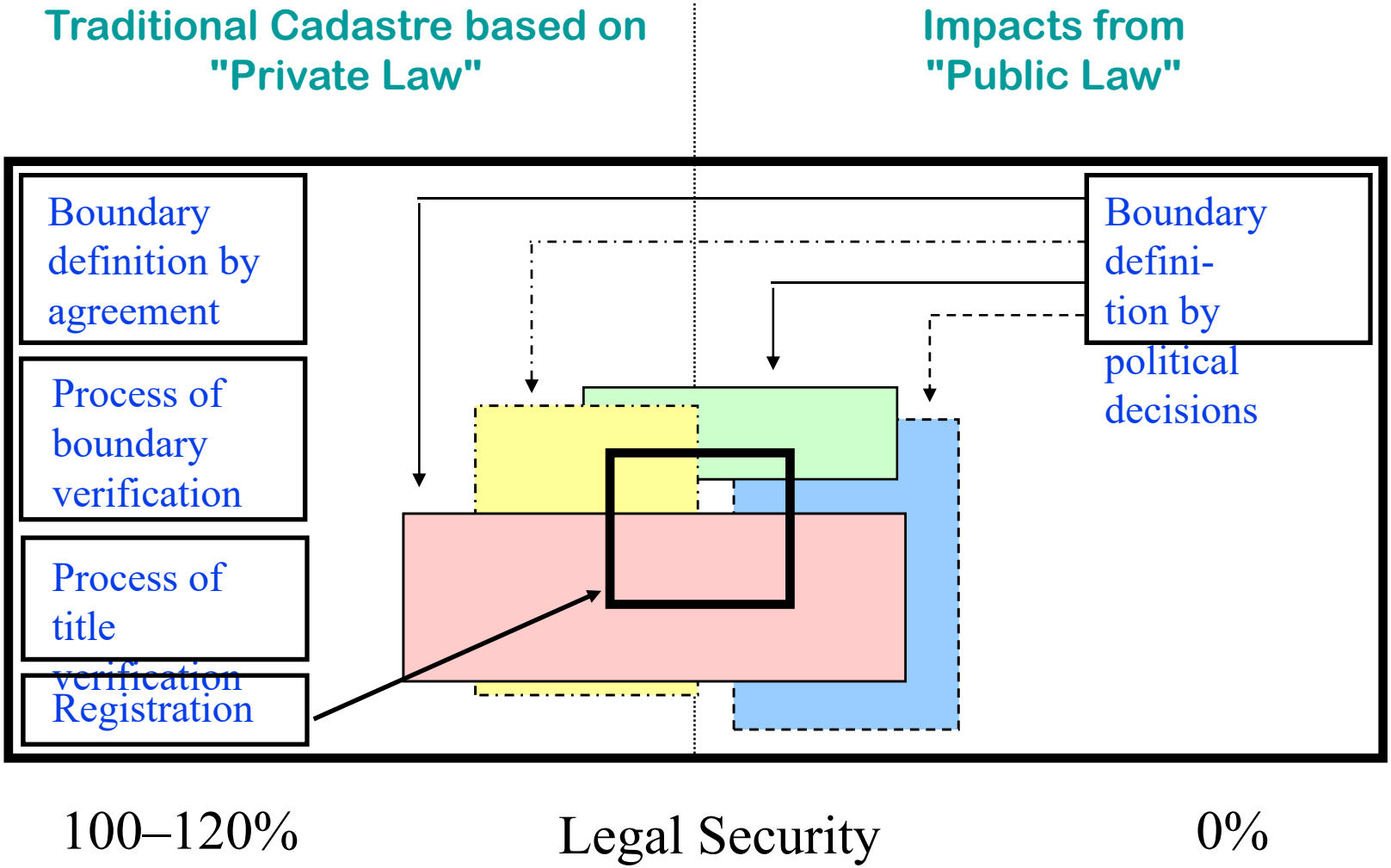
Cadastre 2014

Booking principle
Consent principle
Principle of publicity
Principle ofs peciality

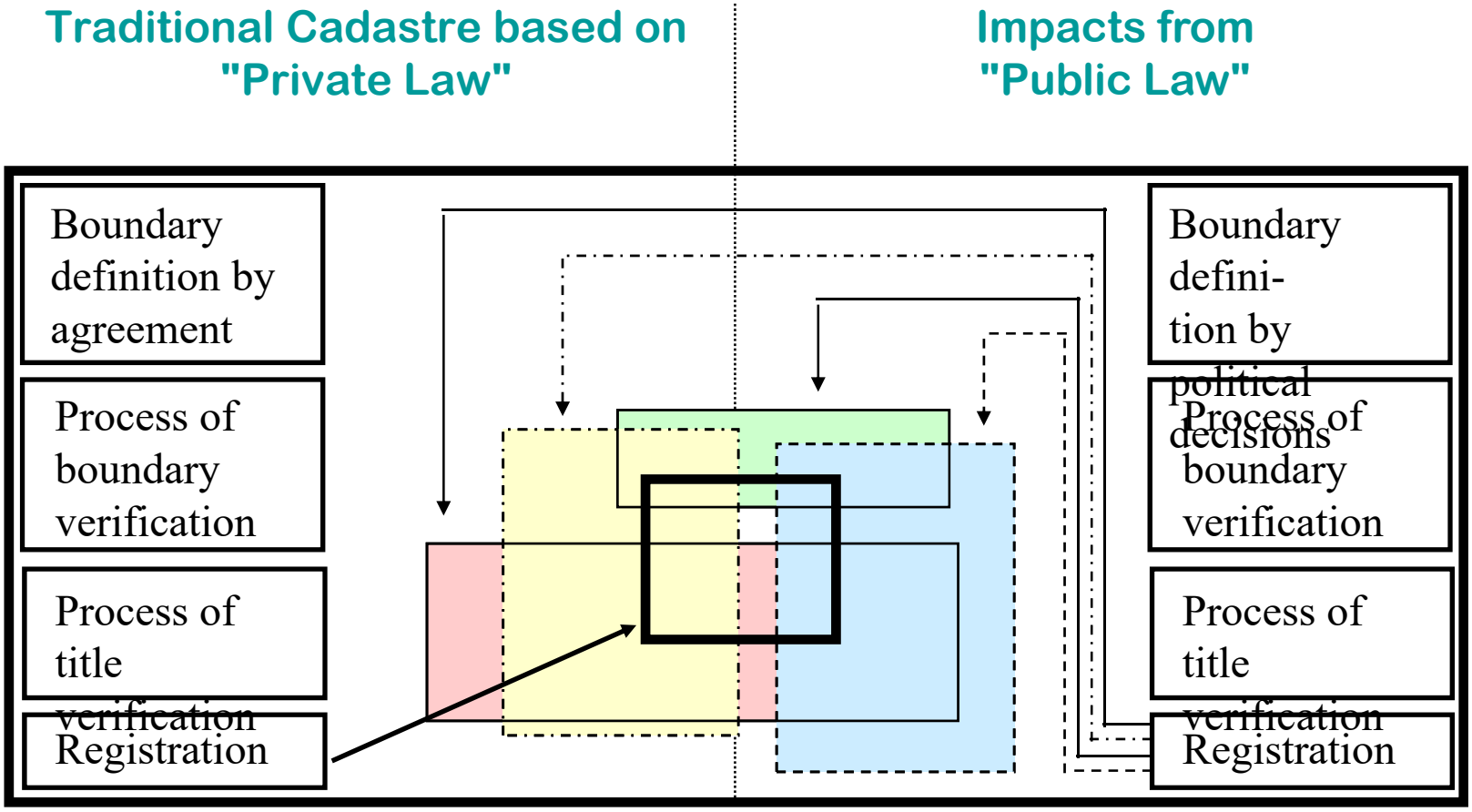
Statement 1 on Cadastre 2014

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

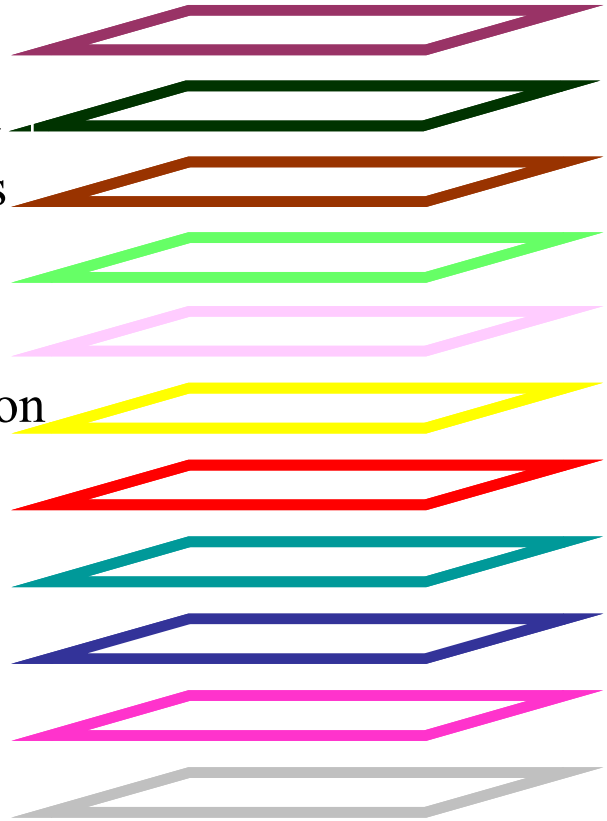



Traditional Cadastre based on "Private Law"
Impacts from "Public Law"
Boundary definition by agreement
Process of boundary verification
Process of title verification
Registration
Boundary defini-tion by political decisions
100–120%
Legal Security
0%

Cadastre 2014 documenting "Private Law" and "Public Law"

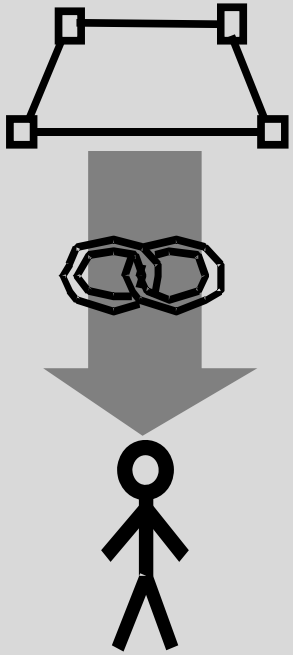


The principle of legal independence

Legal Topics:	Land Object Boundaries:	Rightful Claimants:
.....		.....
Resource exploitation		Chartered company
Collective land rights		Corporation
Water Protection		Society
Traditional rights		Tribe, Clan
Environment Protection		Society
Land Use Planning		Society
Land Property		Private Land Owners
Topography		Society
Natural Resources		Society
Natural Land Objects		Society

Relation man/land in Cadastre 2014

parcel – legal land object



object

right

legal relation

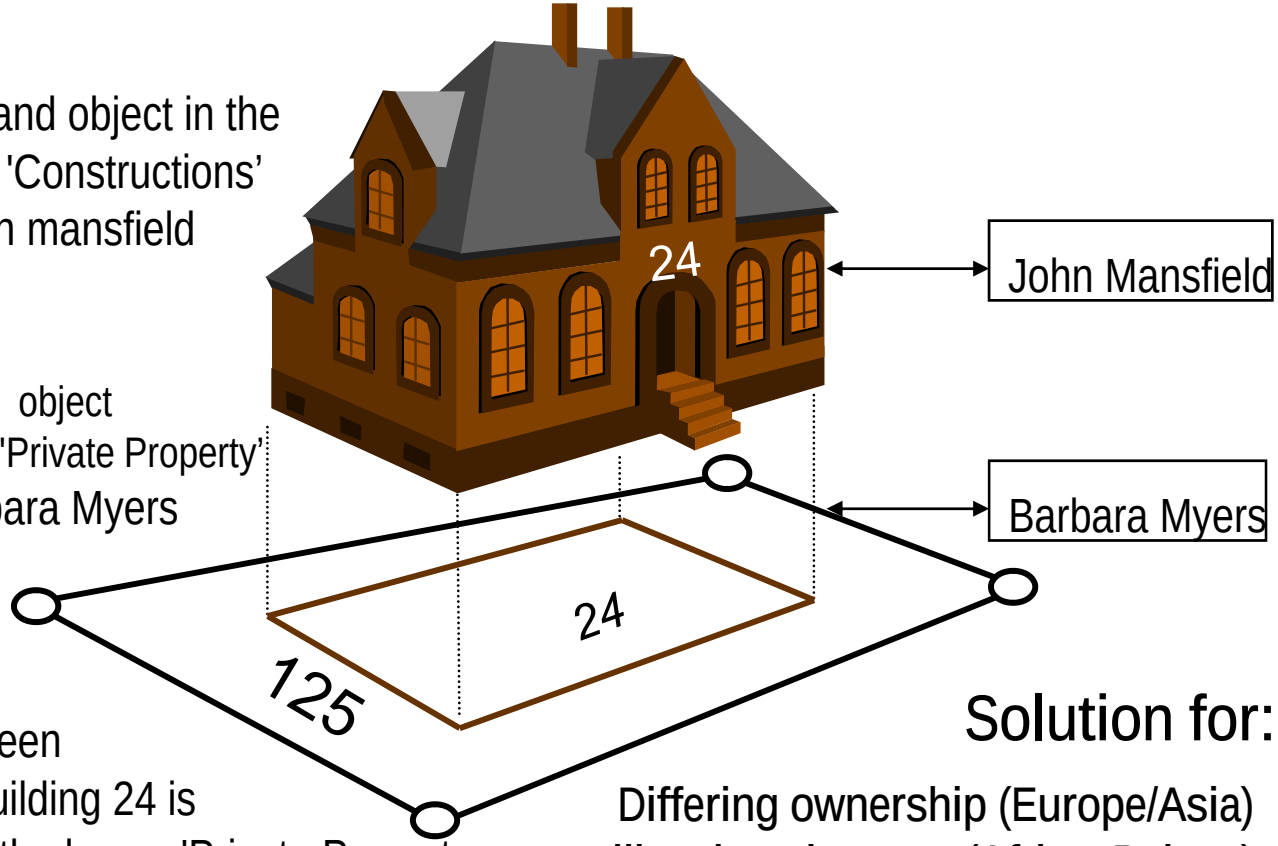
man – rightful claimant

subject

Legal independence the solution for many problems

Building 24 is a land object in the information layer 'Constructions' belonging to John mansfield

Parcel 125 is a land object of information layer 'Private Property' belonging to Barbara Myers

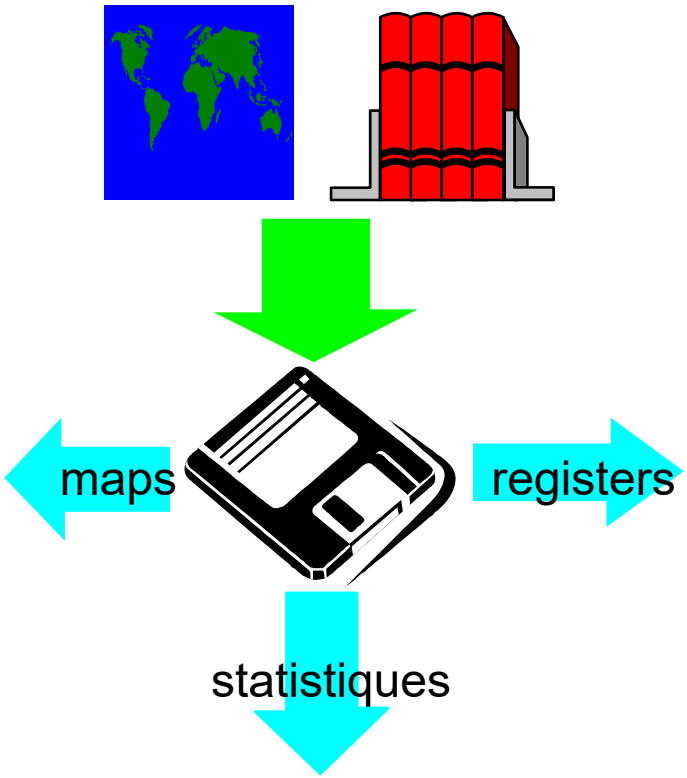


The relation between parcel 125 and building 24 is found by 'cutting' the layers 'Private Property with 'Constructions' (no links!)

Solution for:

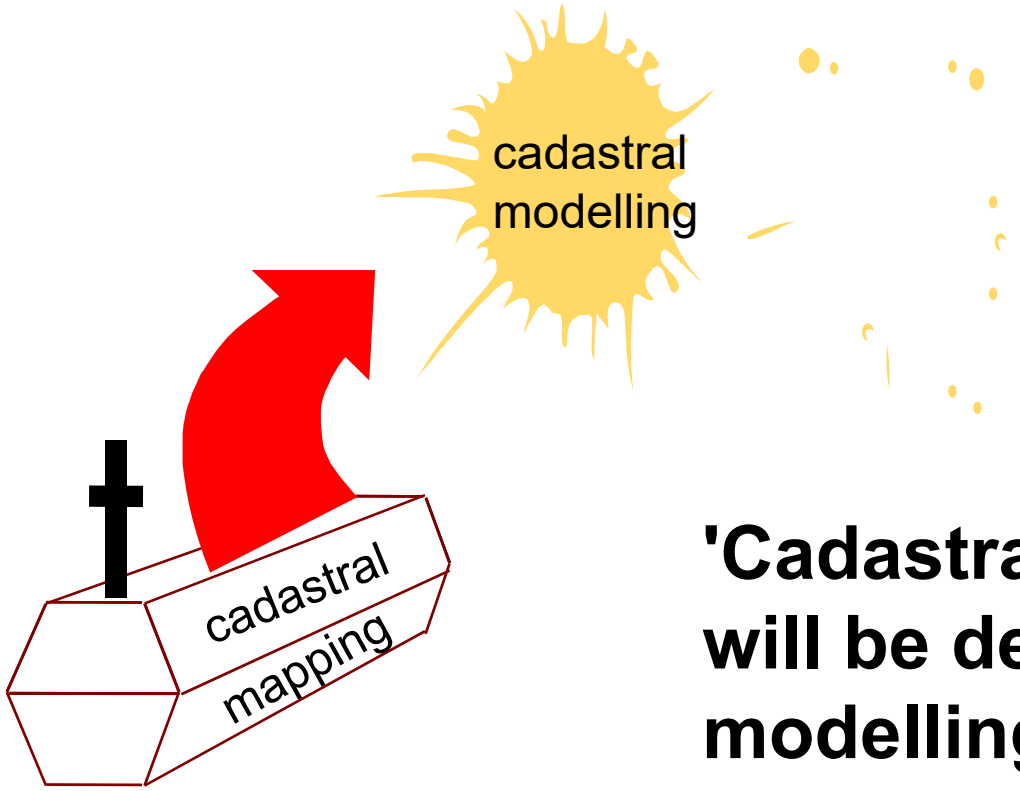
Differing ownership (Europe/Asia)
illegal settlements (Africa, Balcan)
tribal rights (Australia, New Zealand)

Statement 2 on Cadastre 2014



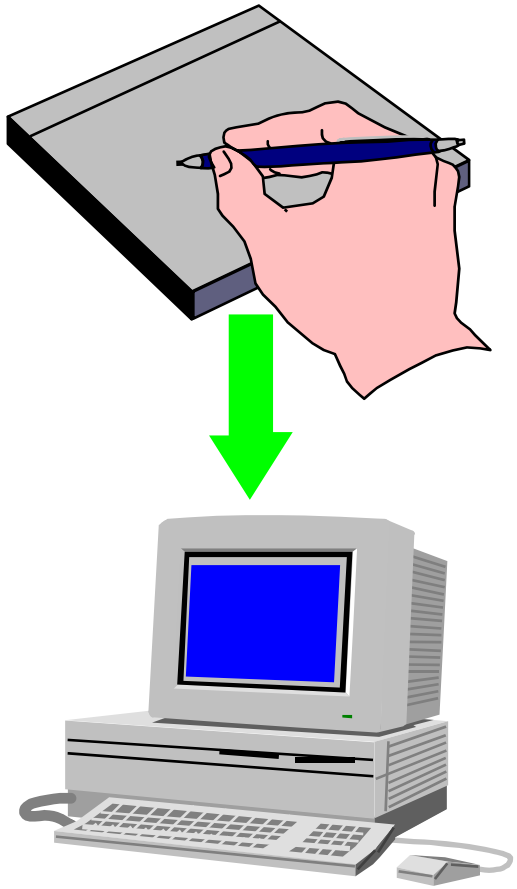
The separation between 'maps' and 'registers' will be abolished!

Statement 3 on Cadastre 2014



'Cadastral mapping' will be dead! Long live modelling!

Statement 4 on Cadastre 2014

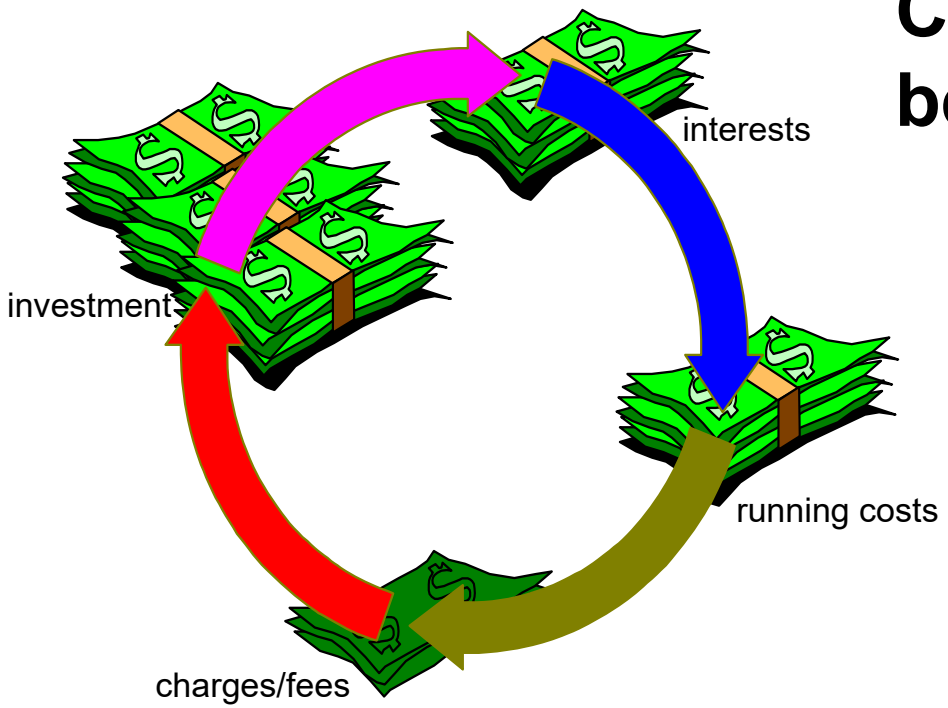


'Paper and pencil cadastre' will be gone!

Statement 5 on Cadastre 2014

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

Statement 6 on Cadastre 2014



Cadastre 2014 will be cost recovering!

Cadastre 2014

- Cadastre will have **larger extent**.
- **Digital format** will require another way of thinking, but offers a lot of new opportunities (modelling, not mapping / linkeage of spatial and textual data also across organization boundaries will be easier).
- **Cost awareness** will increase (private sector will be more involved).
- Translations into 22 languages
- Presentations FIG, WPLA, etc.
- CH: Initiative c2014 of IGS, Law on geoinformation
- D: BDVI initiative
- FL: Government initiative
- System suppliers: ESRI, Intergraph, ARIS
- Take your laws
- Identify legal land objects
- Model the land object:
- Land object🡐🡒 legal content 🡐🡒rightful claimant
- Implement model

Cadastre 2014 – Recommendations to surveyors:

- to complement the traditional skill of producing maps and plans with dealing with information and data models;
- to understand the phenomenon of public law land objects;
- to play the role of a land administration specialist.

How can FIG promote and support Cadastre 2014 ?

- by establishing a competence centre for modern cadastral systems;
- by developing recommendations for a future national licensing policy for land surveyors;
- further use of its contacts with govern-ments and NGOs.

How can national organizations contribute to Cadastre 2014 ?

- by distributing information from FIG to their national members and their government;
- by promoting better land policies and greater legal security;
- by providing skilled and acknowledged specialists as consultants to governemnt.

Cadastre 2014 will:

- contain all types of rights and restrictions;
- make substantial use of new information technology;
- benefit of the co-operation between public and private sector;
- have economical structure where cost recovery will play a role.

Land Inventory

Land Inventory vs Cadastre and Register

Land Inventory is:

- Is technically designed, tax-oriented
- Parcel based where possible
- Without legal consequence
- Allows collection of multi-purpose data
- It can facilitate land use planning
- Laws, rules and regulation will differ between first land inventory, first registration and cadastre and maintenance of cadastre and register

When land Inventory is necessary?

When
Land conflict rises
Land become scarce
Land use is not regulated
Land is grabbed by the powerful
Land tax generation not sufficient

Preconditions for Land Inventory work

- Political backing
- Legal framework –
  - permission to question people
  - permission to enter premises,
  - storing personal data (collecting only relevant data!)
- Concept available for authorities to act against violations

Desired content of Land Inventory

- Location, size, presumed owner or real possessor
- Present use of the land parcel
- Parameters influencing land tax value
  - Rental value
  - Location
  - Existing infrastructure
  - Services available
  - Construction cost of building
  - Soil quality for rural land

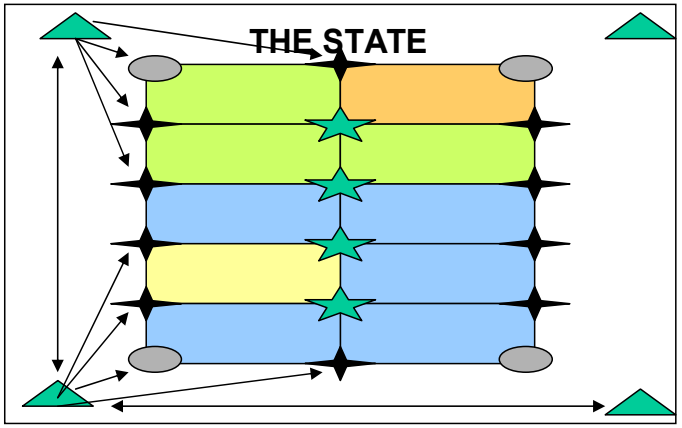
Who has to do it

- It can be performed through Public/private partnership
- Evaluation of the data can be done by national agency or local government
- Field investigation can be by private sector
- Training and necessary equipment must be in place to encourage private sector

- It needs pre-hand assessment of
  - How much will it cost
  - How long may it take
  - How will it work
- Transformation of Land inventory in to Cadastre/Register
  - Through new legislation, one stroke or
  - Sporadic, step by step
  - Offering mechanisms for updating

Example of Systemic and Sporadic Registration

Sporadic versus Systematic Registration



4 points determined 4 times

10 points determined 2 times

4 points determined 1 time

40 points measured instead of 18

<u>Systematic:</u> 10 owners called upon, once

<u>Sporadic</u> (in the course of time):

6 times 6 owners called, plus 4 times 4 owners

52 presences in the field instead of 10

Public Awarness

Create Corporate Identity for Execution

- Logo
- Slogan
- Uniform
- Stickers
- Gifts

Identifying target groups in land inventory

- land owners/possessors
- state institutions handling land affairs
- municipalities, local government
- utility operators
- banks
- notaries
- real estate agents
- Campaign level can be
  - National
  - Regional
  - Local

Media Selection

- TV, Radio, Newspaper
- Local radio, flyers, leaflets
- Local presentations
- Video clips, threats, puppets…
- Contents of Campaign
  - Disperse suspicion
  - Clarify right and duties
  - Constitutive moment selection

Data Capture and Tools for Land Information

Sequence of planning

- Define the objective
- Develop some alternatives

  to achieve the goal
- Compare the alternatives
- Choose the best alternatives
  - Social acceptance
  - Ecology and safety
  - Best cost/benefit relation

Digitizes (compile) existing data

- Legal data – from legal register
- Cadastre data - from maps
- Administrative boundaries - from maps
- Utility - from plans/sketches
- Check whether up-to-date, conceptually necessary, apt to be maintained for validity!
- Digitize features relevant for GIS

Socio-economic data capture

- Can be capture by
- Questionnaire and
- Digital photo (documentation and building)
- Possible to document also
  - Land use
  - Planning restrictions
- Editing can be done in the field
- Final output can be deposited in decentralized office

Building Metadata Base

- Metadata mean data by data
- Topographic map series sheet layout
- Document of aerial photo (photo centre, flight index, parameters, date, owner, storage place)
- Orthophotos

Geo-data Capture

- Interpretation of satellite imagery
- Aerial photography
- Field survey
  - Total station
  - DPT (Digital Plane table)
  - Classical tools (tape, theodolite, compass..)

Legal Data Capture

- Questionnaire on
  - Ownership
  - Lease
  - Mortgage
  - Easement (right of way)
  - Can be on paper or with handled plmtop

Utility Information Management

General Consideration

- Linear objects with corridor
  - Underground (pipes, cables)
  - Overhead (electricity, telephone)
  - On the ground (pipes, elevated transport)
- Solid objects on parcel or technical building
  - Transformer
  - Booster or pumping station
  - Pylon for high tension line

Respect Existing right

- Right of way to acquire
  - From legal public or private land owner
  - From other corridor holders
  - Crossing over or under other utility provider
- Optimum geometric and hydraulic design to cross others property
- Compensation for
  - Damage and loss
  - Permanent use of space

Safety and timely maintenance

- Complete documentation
  - Material
  - Position
    - Maps
    - LIS
  - Database
  - Scheme, layout, charts
- Obligatory safety measures during construction
- Safety of operation
  - By automated monitoring of regular performance
  - Regular visual inspection
  - By customer's call
- Permanent maintenance
  - Of information about change in legal and physical situation
  - Of installation
- Replacement after end of lifecycle

Building Technical Capacity

- Geodetic control
- Photogrammetric control
- Production of DOM and vector map
- Fieldwork and data processing
- Quality control

Training

- Define Curricula for training
  - Land technician
  - Engineer
  - Land manager
- Design recruitment criteria
- Train trainers for technician level
- Install higher education for land manager at university level
- Support scholarship at foreign education institutions

Promote Private Sector Activities

- Support through training
- Initiate creation of professional associations (Surveyor, planner, valuator)

Management tools

- Personnel development plan
- Lifelong learning
- Operational planning
- Timesheet evaluation
- Analytical accountancy
- Monitoring and evaluation
- Change management

Regulations for land management

- General (ecological, social..) criteria
- Regional planning
- Rural development plan
- Urban planning
- City master plan
- Sanctions against wrongdoers
- Right of pre-emption

LIS database can be used by

- Decision maker
- Urban planners
- Utility companies
- Land agents
- Bankers
- investors