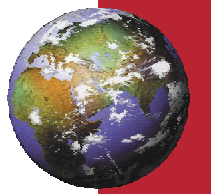
Innovative Technology for Land Administration with emphasis on Pro Poor Land Management



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ITC, Enschede, the Netherlands

International Conference on Enhancing Land Registration and Cadastre for Economic Growth in India, Organized by

Map India 2006, GIS Development and FIG Commission 7 at

Hotel Taj Palace, New Delhi, India, 31 January – 1 February 2006.

Contents

- Introduction
- Current Urban Land Management
- Pro Poor Land Management
- Innovations
- Technology for Land Administration

Introduction

- Land is a key asset for the poor
- 900 million people who live in slums and informal settlement worldwide, and among them are 570 millions that live in the Asia-Pacific region
- No safe and secure land/housing; excluded from city planning; and mostly evicted from their lands
- Specially women, indigenous people and disabled people are not able to defend their rights on land
- Live in health- and life- threatening environments on marginal land, vulnerable to flooding, landslides and other environmental hazards.
- Informal settlement, slums, squatters, etc. are growing too rapidly. Informal and formal systems coincide making difficult to manage land and housing.

Introduction

- UN-HABITAT launches pro poor land management as an effort to achieve MDGs which itself is innovative concept yet flexible approach depending on local situation
- Pro poor land management requires Geo-information that can be derived from many sources.
- Field surveys, Aerial photographs and satellite images are important sources for Geo-information

Problems on Current Urban Land Management

- Centralized decision making; local authorities hardly play a role
- Insufficient use of urban space
- Public sector dominated approaches
- Rigid and costly regulatory frameworks
- land recording systems and centralized information systems:
  - Lack of effective tools
  - Poorly maintained and often coverage incomplete
  - Inefficient, inaccessible and very costly systems
- Unable to deliver secure land tenure

Pro poor land management

- It integrates slums or informal settlement into city planning approaches based socio-legal framework
- Its characteristics:
  - Gender based approach
  - Appropriate and flexible tenure form
  - Community participatory planning approach including informal land delivery processes
  - linking to service to communities' capacity for sustainability
  - a decentralized land administration that uses local capital, partners with local authorities
  - self reliance or cost recovery approach
- Principle of urban governance
  - Transparency
  - Gender
  - Publicity
  - Participation
  - Accountability
  - Subsidiarity
  - MDGs

Innovations – Three main Issues

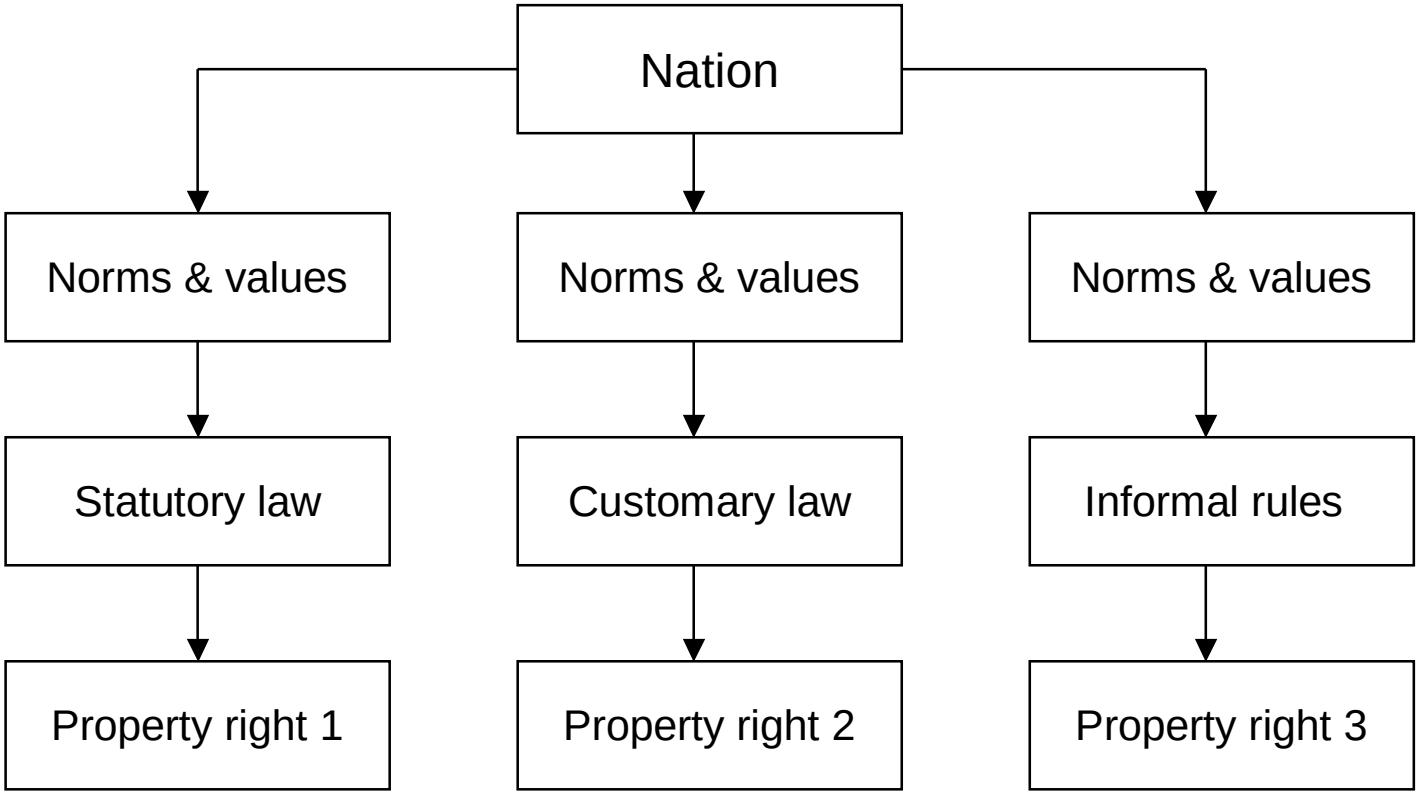
- Land tenure paradigm that provides the poor better ensure security according to their norms and values to be incorporated into urban land policy
- Innovative use of Geo-information technologies (GIT) for effectiveness of land administration i.e. determination, recording and dissemination of land information on tenure, use and value of land
- Local land information systems: affordable and easy access to land information by the poor and civil society; link to central land information to increase reliability and formal recognition of system

Land Tenure Paradigm on Land tenure security

- Changes needed in the relationship of land and people within socio-cultural setting - flexible and incremental approach of Continuum rights and spatial units
- Changes in governmental policies and legislation to accommodate various land tenure systems
- Emerging actors involving local participation (local government, civil society, citizens, etc.) in the processes of securing land tenure
- meeting customer's demands: realise the support land registers and cadastre must provide to the functions that should be facilitated (*according to the land policy*)

A part of Bombay Slums from Google Earth

Property rights - examples



(Molen and Lemmen, 2004)

Technologies in Land administration

- Simple procedures, quick, and low transaction costs
- Simple transparent systems, participatory
- Low cost
- Efficient and effective
- Free from political pressure
- Low cost demarcation
- Mechanisms conflict resolution
- SDI at low cost, transparent and accessible for linking registers of different categories and at different levels (local village level to central level)

Traditional surveying

- Plain table,
  Measuring tapes,

Measuring by
a tape

- Theodolite –
  measuring horizontal
  and vertical angles

Modern surveying

- Total stations

Measuring by
a total station

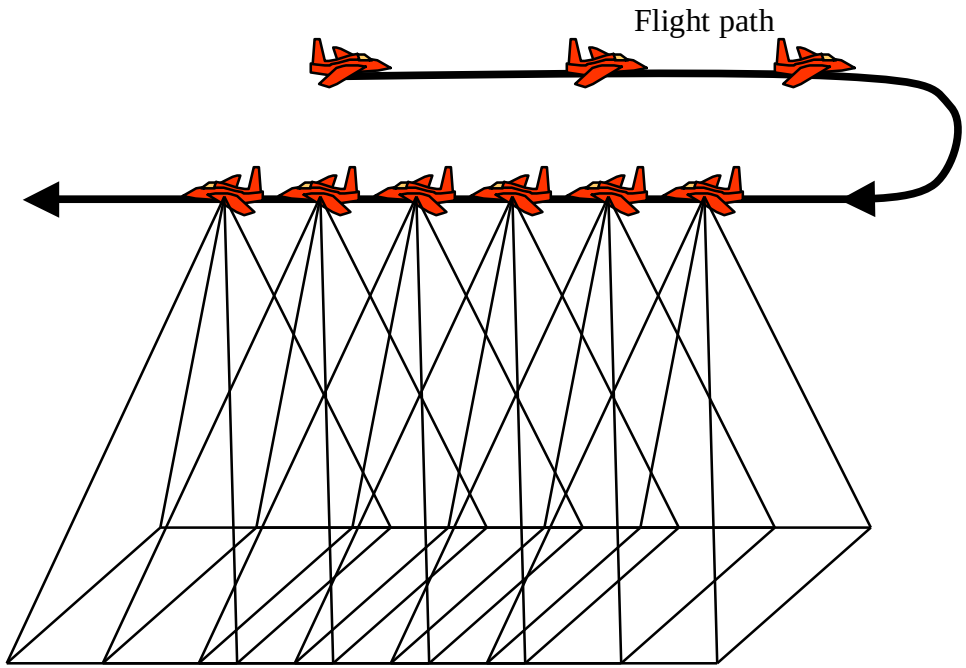
- Global Positioning System (GPS)

Measuring by
a GPS

Digital Photogrammetry

Piper Navajo Chieftain (PA31)
Used for Low and Medium Altitude Missions

Wild RC10 Camera



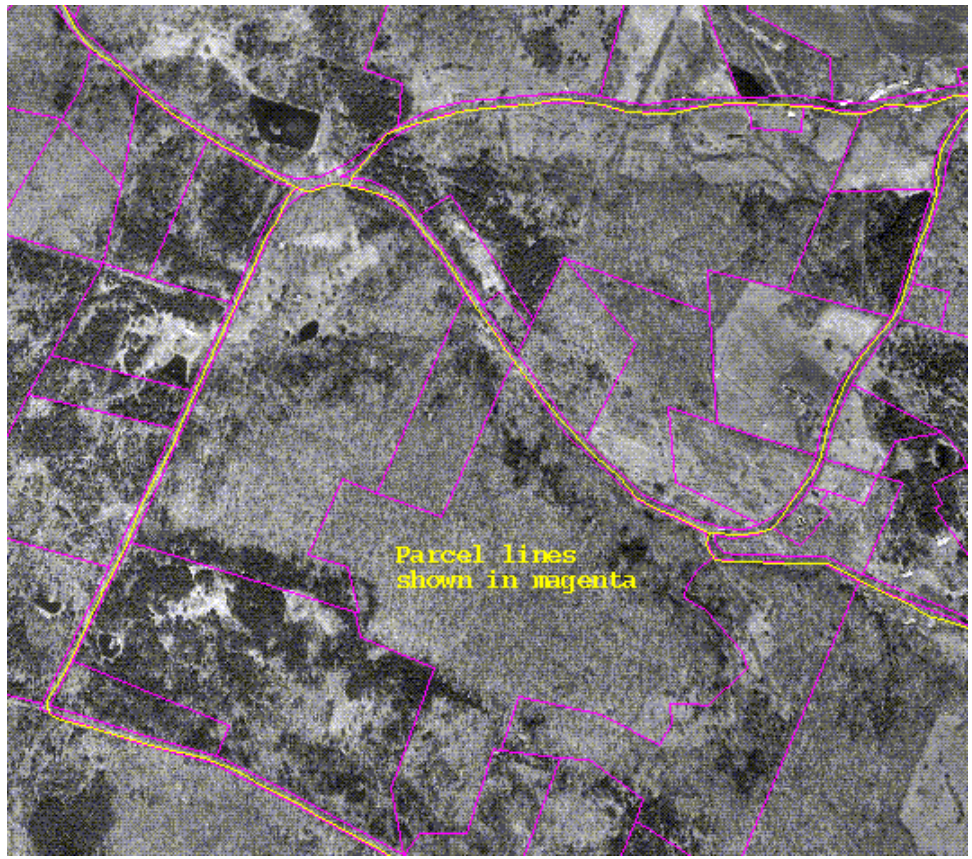
Examples of Vertical Photograph

Windhoek, Namibia

Enschede,
The Netherlands

Boundary Identification

- Rural or Customary areas
- Boundary identification simple in field
- Involvement of local during adjudication



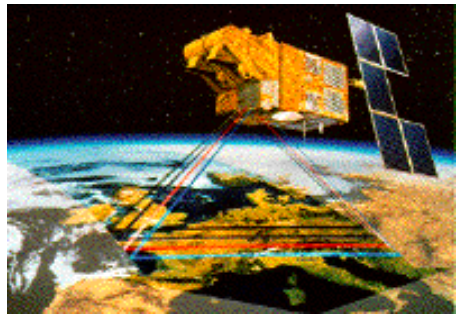
Small Format Aerial Photograph

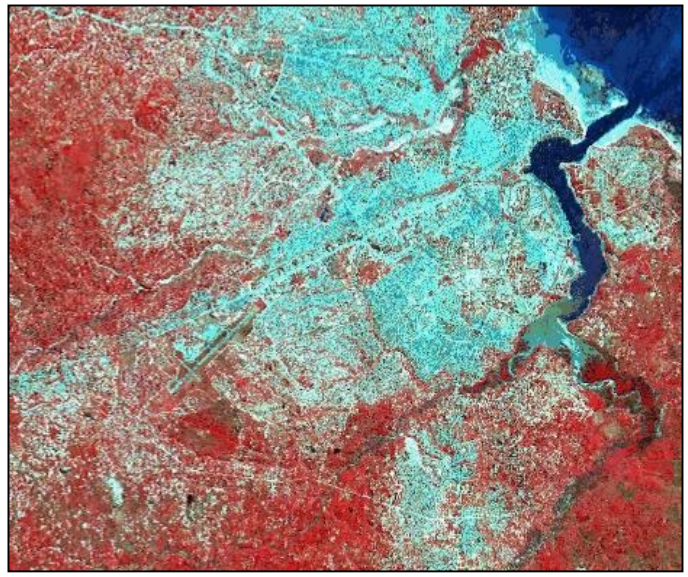
- Cheap way to acquire aerial photo from aircraft using a handheld camera
- Rapid mapping at low cost
- Used for urban planning for informal settlement area

Rectified photographs using DEM in
Keko Mwanga Dar es Salaam, Tanzania

High Satellite Images

- Advantages over Aerial photographs:
  - large areas
  - Digital data continuously captured
  - Easy maintenance of Geo-information
- Many High Resolution Satellites such as
  - SPOT – 10m (P) and 20m (XS)
  - IRS - 5.6m (P), CartoSat (P)
  - IKONOS – 1m (P) and 4m (XS)
  - Quick Bird - 0.6m (P) and 2.44m (XS)



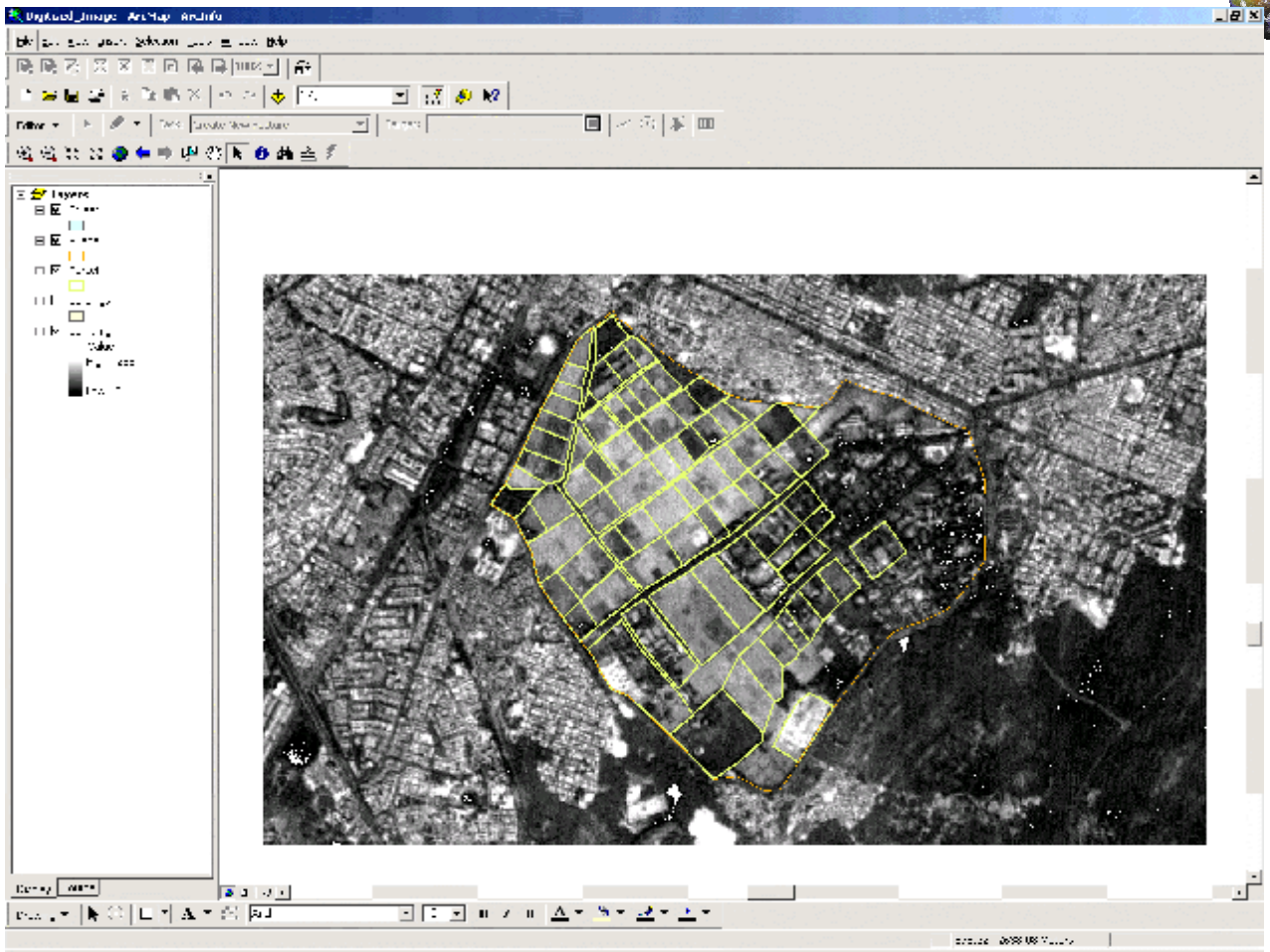


Spot XS/PM 1998

Remote Sensing image– IRS 1C

Experiment:

- Aggregated spatial units can be detected
- Individual parcel boundaries not possible
- Suitable for Village Information system



IRS 1c image in GIS environment

Remote Sensing image - IKONOS

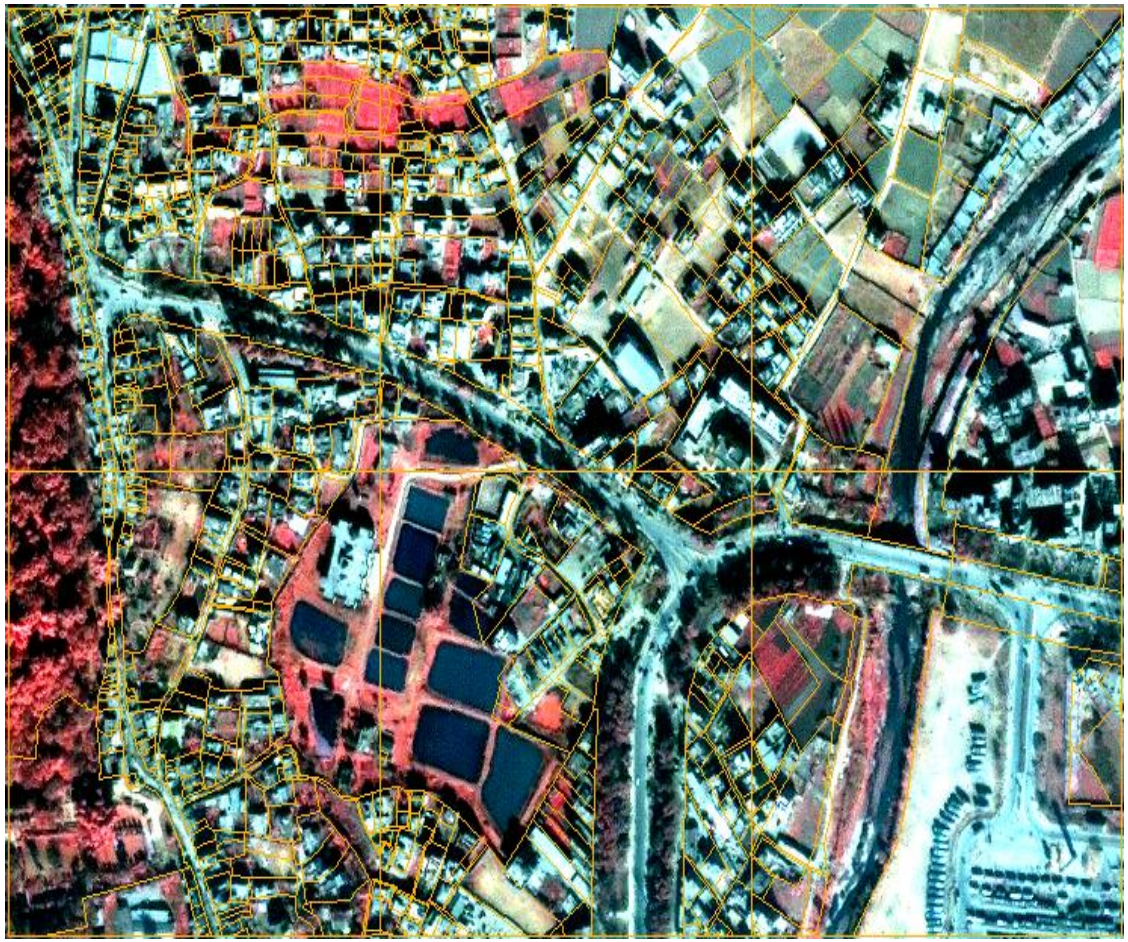
- A relatively rapid, cost effective and mass production to achieve initial registration
- Unit cost of surveying each land parcel can be kept low through economies of scale
- Provides a historical record of landscape that can be revisited in the future to see what changes have taken place and even to re-measure conditions in the past. Thus where dispute arise over whether a boundary has been moved, old photographs or images can provide crucial evidence.

IKONOS image in Enschede, the Netherlands

IKONOS images

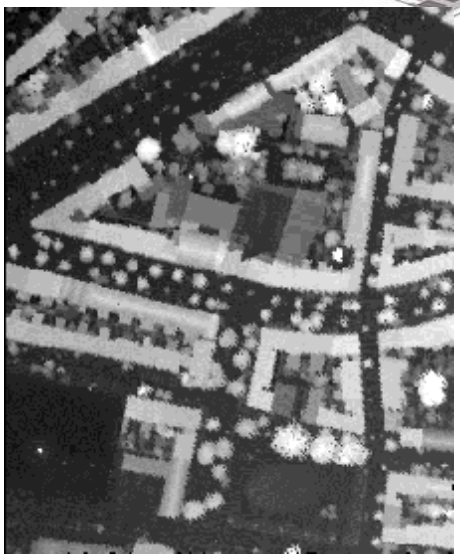
Experiment:

- Geometric quality ±3m
- Parcel boundaries comparable with original cadastral maps
- Topographic objects such as Building, streets, rivers are easily extracted
- For dispute resolving it is a very good tool



IKONOS image in Kathmandu area

Laser scanners



Digital surface Model Nijmegen

Color image Nijmegen

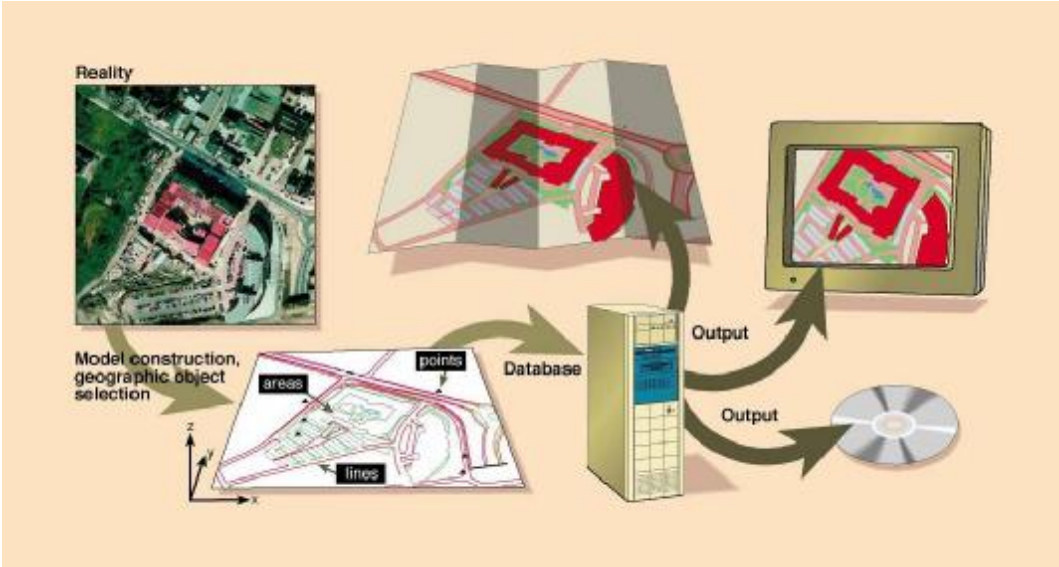
LIDAR – FALCON TOPOSYS

Range	1600 m
Distance resolution	1.95 cm
Scan width	14.3°
Scan rate	653 Hz
Laser pulse rate	83 000 Hz
Effective measurement rate	83 000 per sec.
Laser wavelength	1560 nm
Eye safety distance	0.5 m

Potential is high but still
Under research

Land Information systems (Central/Local)

- Descriptive components
  - Agreement/evidences
  - Register of tenure rights and rights holders – customary groups, family, individuals
- Spatial components
  - Identification of the spatial objects – tenure units, customary areas, family parcels, individual parcel
  - Cadastral maps
  - Geodetic reference system
  - Unique identifiers
- Work processes



Integrated Geo-Information system

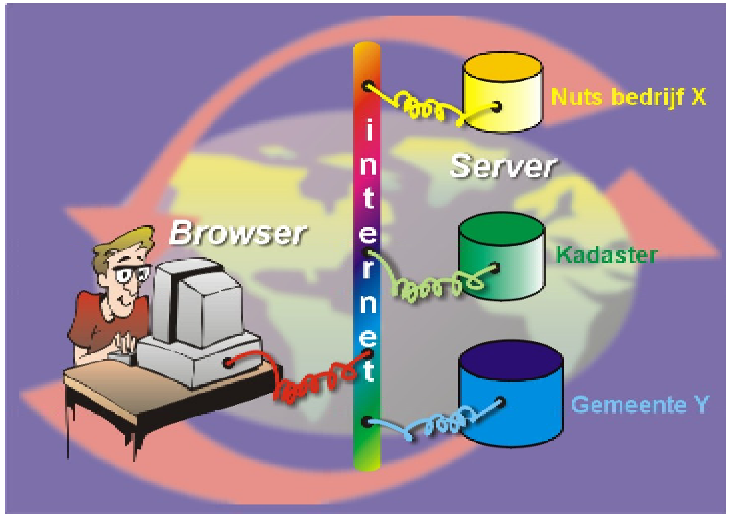
Modeling standards and Database Technology for LIS

- Management, transaction and supplying cadastral information
  - Modeling standards for Land information system (using UML, XML/GML)
    - Core domain models, standards for data collection, data processing, data storage and data dissemination
  - Database technology
    - Integrated Geo-database combining spatial and non-spatial data
    - Relational/object oriented database
    - Efficient update and query mechanisms
    - OGC and ISO standards

Practicing modeling cadastral databases in Cairo, Egypt

Integrated Geo-Information system

- Improve quality, cost effectiveness, performance and maintainability of Land Information Systems
- GI part of integrated Information System architecture within and outside organizations
- Accessibility improved
  - Internet development
  - Wireless communication
- Now many vendors provides excellent and user friendly GIS/RS software



Conclusions

- Innovations on land tenure security in according to land policy
- Aligning Geo-information technologies with the processes of determination, recording and dissemination of information on tenure and use rights of land. This includes gendered participatory approach and tenure mapping
- Land information system enabling easy maintenance, access at all levels.

Thank you for your attentions