

Towards “Smart Cadastre” That Supports 3D Parcels

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- Background
- What is Cadastre Vision 2020? – Cadastre System Development
- Why? – Driving Force
- What do we want?
- How? - Cadastral Innovation

Singapore – Economic Growth



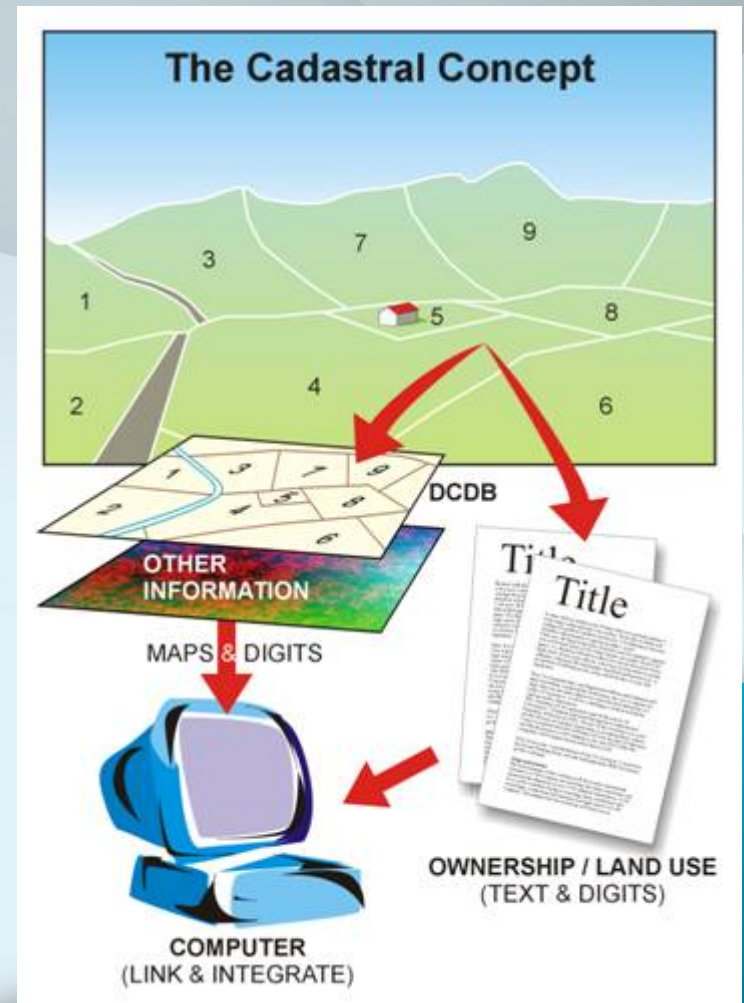
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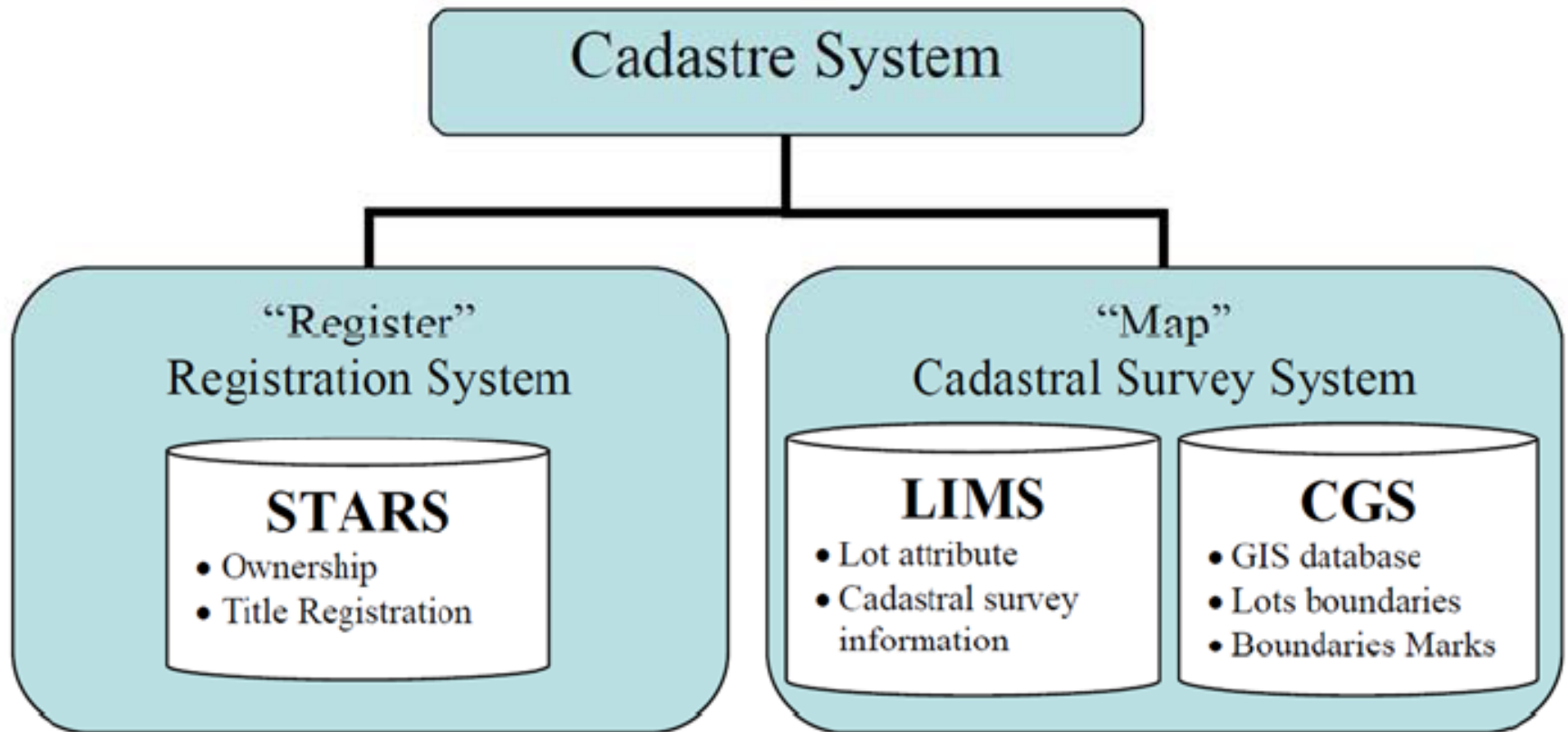
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Cadastral System in Singapore

- Comprehensive register of real properties
- Property ownership framework
- Adopt Torrens system
 - The register: Registration of Titles
 - The map: Cadastral Survey



Cadastral System in Singapore



Modern Cadastral Survey System – the SVY21 system

Establish ISN



Land lot survey



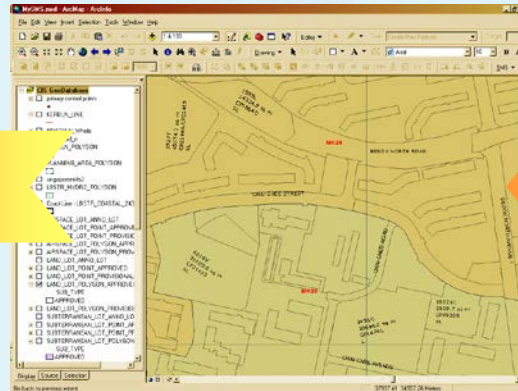
Data preparation and plan drawing



Electronic Submission



Cadastral information distribution



Data uploading to GIS and cadastre database



Job inspection and plan approval by Chief Surveyor

File Edit View Insert Selection Tools Window Help

1:4,133

Task: Create New Feature

Drawing

Arial 10 B I

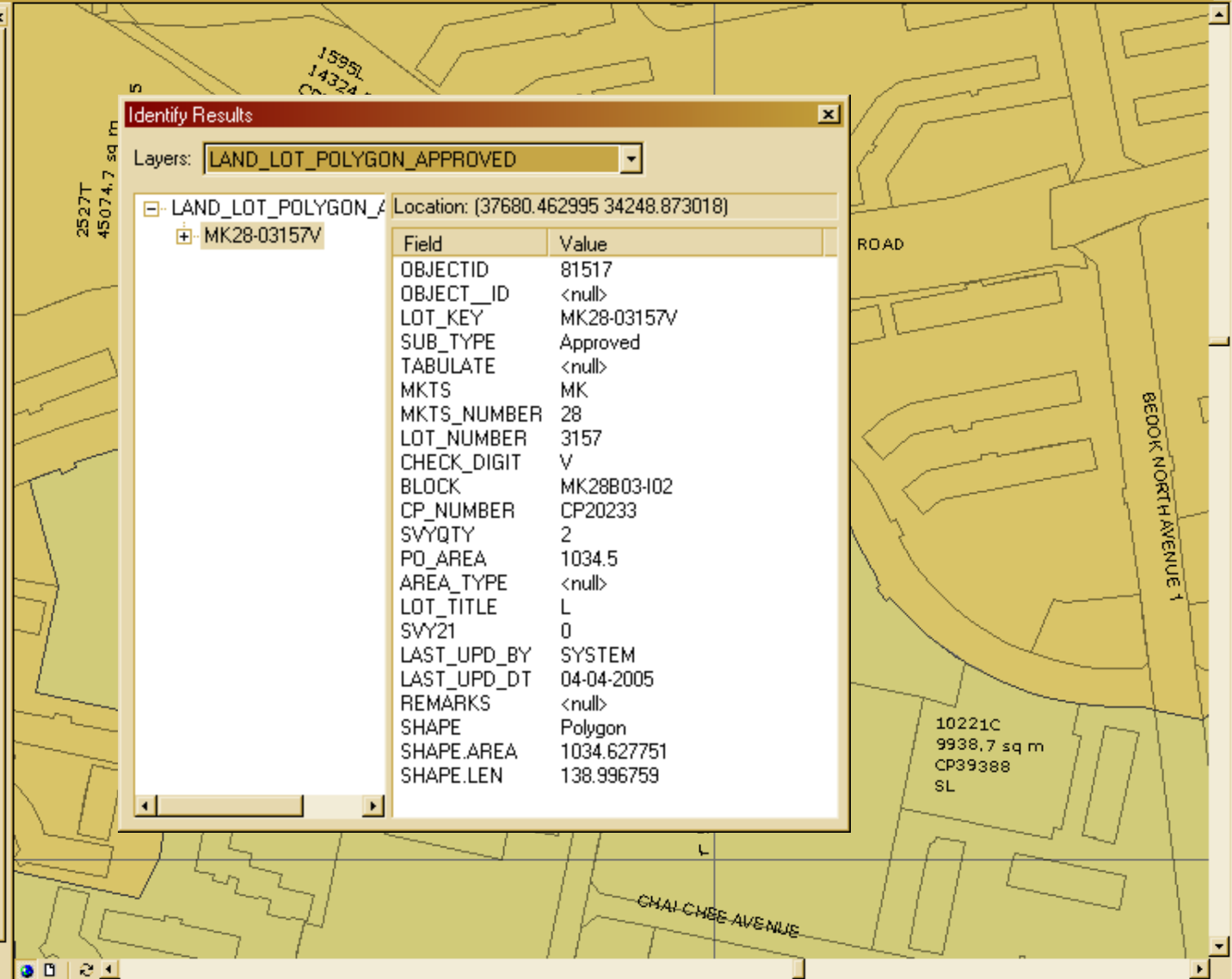
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SMS

CIS GeoDatabase

- primary control points
- KERBLN_LINE
- RDATBLN_Whole
- main_road_n
- KERBLN_POLYGON
- PLANNING_AREA_POLYGON
- singaporemkt2
- LBSTR_HYDRO_POLYGON
- Coast Line - LBSTR_COASTAL_243
 - AIRSPACE_LOT_ANNO_LOT
 - AIRSPACE_LOT_POINT_APPROVE
 - AIRSPACE_LOT_POINT_PROVISIC
 - AIRSPACE_LOT_POLYGON_APPR
 - AIRSPACE_LOT_POLYGON_PROV
 - LAND_LOT_ANNO_LOT
 - LAND_LOT_POINT_APPROVED
 - LAND_LOT_POINT_PROVISIONAL
 - LAND_LOT_POLYGON_APPROVEI
 - SUB_TYPE
 - APPROVED
 - LAND_LOT_POLYGON_PROVISIOI
 - SUBTERRANEAN_LOT_ANNO_LO
 - SUBTERRANEAN_LOT_POINT_AF
 - SUBTERRANEAN_LOT_POINT_PF
 - SUBTERRANEAN_LOT_POLYGON
 - SUB_TYPE
 - APPROVED

Display Source Selection



Identify Results

Layers: LAND_LOT_POLYGON_APPROVED

Location: (37680.462995 34248.873018)

Field	Value
OBJECTID	81517
OBJECT_ID	<null>
LOT_KEY	MK28-03157V
SUB_TYPE	Approved
TABULATE	<null>
MKTS	MK
MKTS_NUMBER	28
LOT_NUMBER	3157
CHECK_DIGIT	V
BLOCK	MK28B03-102
CP_NUMBER	CP20233
SVYQTY	2
PO_AREA	1034.5
AREA_TYPE	<null>
LOT_TITLE	L
SVY21	0
LAST_UPD_BY	SYSTEM
LAST_UPD_DT	04-04-2005
REMARKS	<null>
SHAPE	Polygon
SHAPE.AREA	1034.627751
SHAPE.LEN	138.996759

Cadastral Survey Development – past 20 years

GPS Technology / Infrastructure

- Primary Triangulation with GPS technology (1992)
- Secondary control network known as Integrated Survey Network (ISN) (1995)
- Establishment of SIMRSN for DGPS applications (1999)
- Implementation of SiReNT CORS network (2006)

Co-ordinated Cadastre

- New local co-ordinate system, SVY21 (1995)
- Coordinated Cadastre pilot study (1996)
- Review of the survey directive based on Co-ordinated Cadastre concept (1998)
- Cadastre data conversion (1999)
- Official implementation of Coordinated Cadastre (2004)

Information / GIS Technology

- Electronic Submission via CORENET (2004)
- Job Data Storage System (JDS) (2004)
- Consolidated GIS System (CGS) (2004)
- Lot Information Management System (LIMS) (2011)

Regulations

- 1998 – Boundaries and Survey Maps Act (BSMS) - Coordinated Cadastre
 - Use of GPS technology
 - Electronic submission of cadastral survey
- 2000 – LSA amended to include all types of land survey work

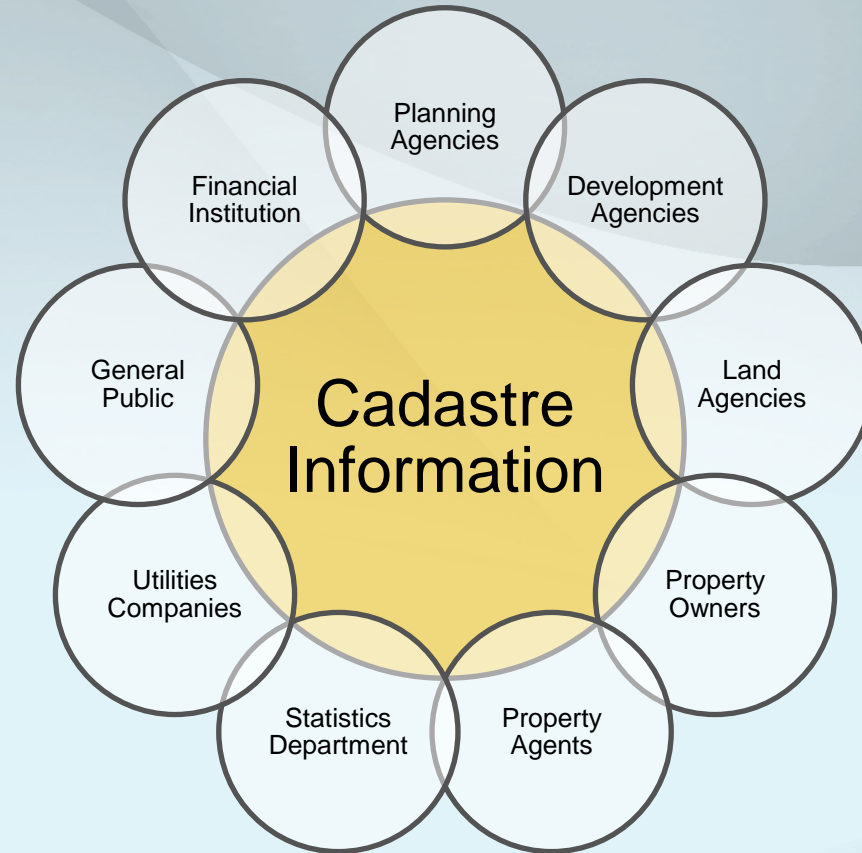
Cadastral Vision 2020 - Development of Cadastral Systems

**2004 - Modern Cadastral
(based on coordinated
cadastral)**

2016 - Smart Cadastral

2020 - Ubiquitous Cadastral

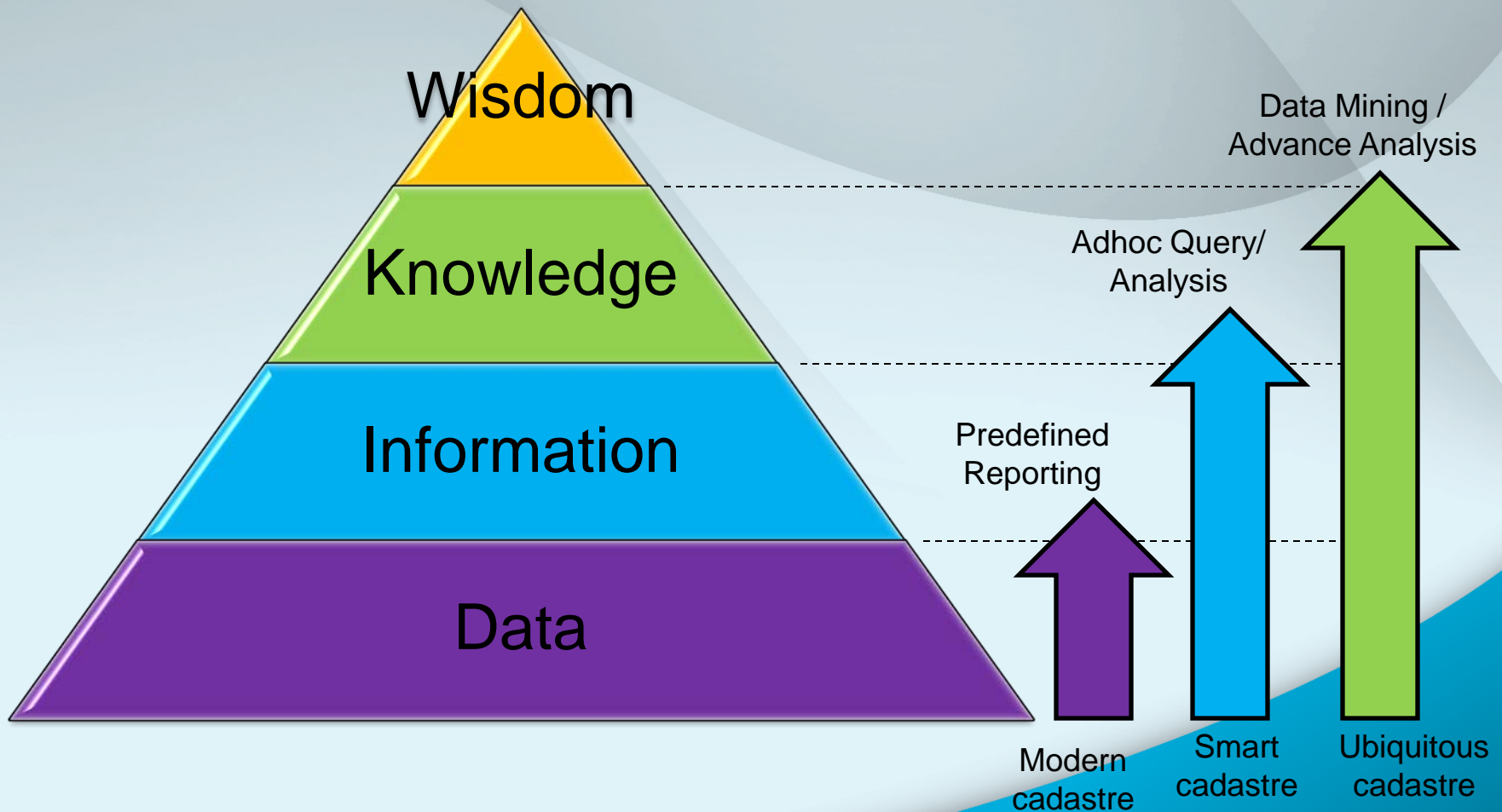
Driving Force – Cadastre Users



Sustainable Cadastre

- Business as usual is not sustainable
 - Current cadastre not fit for future purpose
 - Technology converging – GNSS / GIS / Remote Sensing / Laser Scanning, RFID, Wireless etc.
 - Application converging – Augmented Reality, Mobile devices for information
 - Complex development - 2D vs 3D
 - Development going underground and above ground

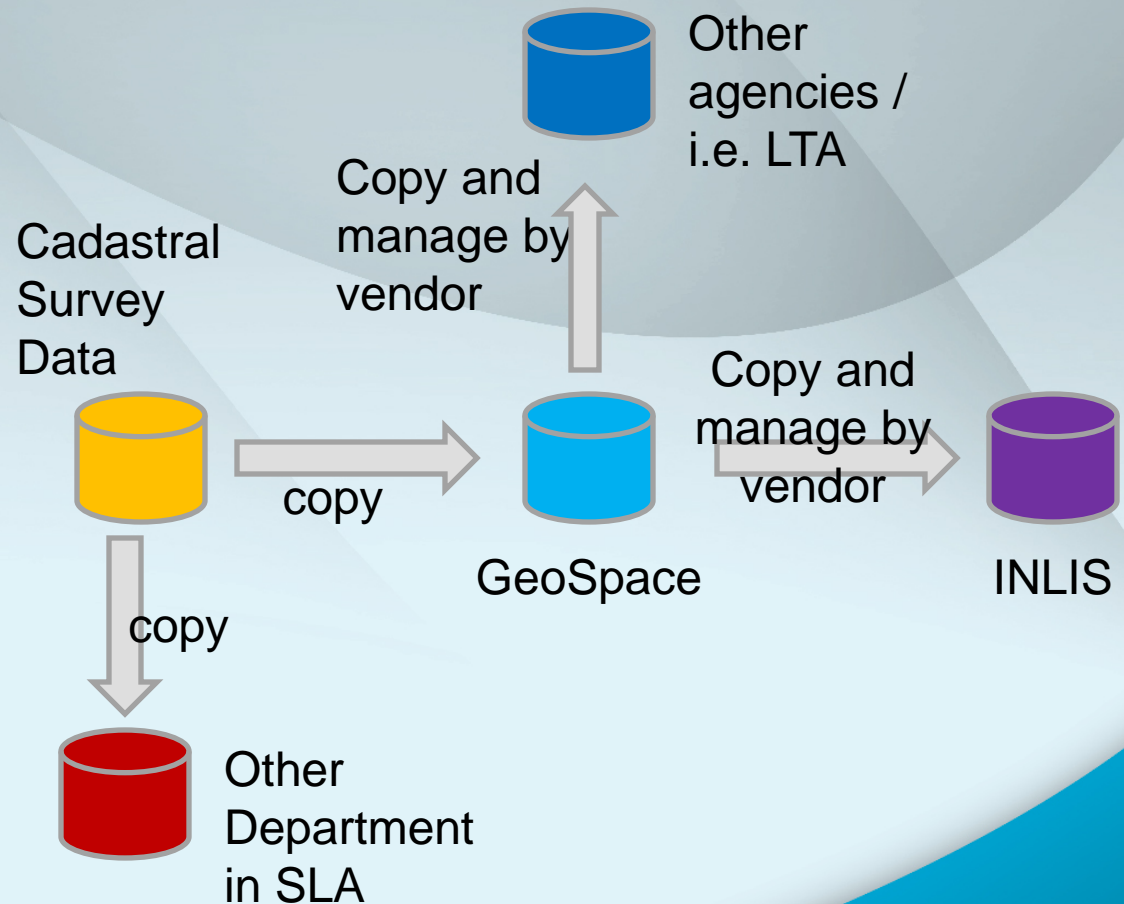
From Data – Information - Knowledge



Cadastral Information Management

• Issues

- Integrity
- Authoritative
- Timeliness
- Bad customer experience
- Data leaking
- Cannot track users



Where do we go from here?



What do we want going forward?

- Reduce risk of errors and improve integrity of cadastre information
- Improve process efficiency and productivity
- Improve users/customers satisfaction
- Spatial enablement in SLA and the Government
 - Wide usage of Cadastre Information System
 - Retrieval of ALL cadastre related information at finger tip
 - Analysis of ALL cadastre information in relation to other information

Vision - Smart Cadastre



Introduce Data Management Regime

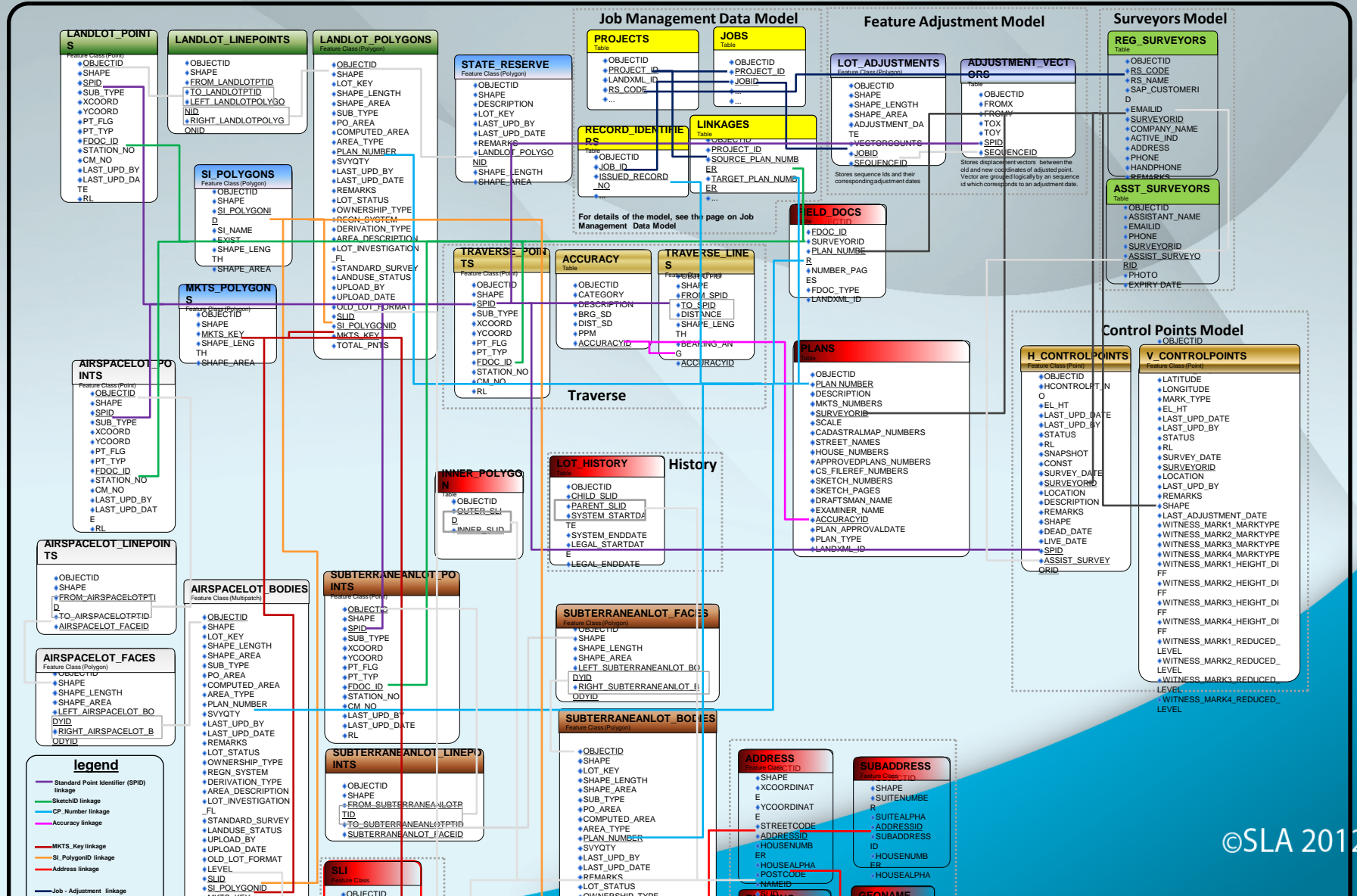
- One authoritative source
 - Ensure timeliness
 - Ensure high integrity
 - Know who are the users, track usage

Adopt Open Source & International Standard

- Cadastre system will not be tied to one type of technology
- Facilitate fast data submission and data sharing
- Facilitate automation
- Facilitate smart data capturing
- Open format for perpetual safekeeping of Digital Cadastre Record

Establish Smart Data Model

SLA Core Cadastral Data Model



Introduce Automation

- Semi-automation in plan checking
- Electronic processing of survey job
- Self-service map interface
- Online information and policy for pre-submission check
- Automation of data extraction - collection of administrative data and plan data
- Plan data to be submitted in “intelligent” form

From 2D to 5D



Authoritative Address

- Currently, addresses are linked to lot number in LIMS database
- Authoritative addresses
 - Build a process of capturing address spatially by the Registered Surveyor.
 - Address info directly capture in GIS
 - New address data type will be created to be linked to the building

Benefits for SLA

- **Reduce risks**
 - ensure high integrity and minimise errors in job approving
 - ensure processing consistency
 - reduce dependency on highly specialised para-professionals
 - long-term security and protection of cadastre information
- **Improve efficiency and productivity**
 - reduce query of the jobs
 - improve work-flow and reduce job processing time
- **Improve decision support**
 - collection of intelligent cadastre information in database format
 - intelligent query
 - improve tracking of users and usage
- **Improve customer satisfaction**

Benefits for Industry

- **Improve efficiency and productivity**
 - ability of pre-populate of data
 - improve turn-around time
 - improve access to cadastral survey information
- **Reduce risks**
 - reduce anomalies and errors
- **Cost Saving**
 - improve work-flow
 - online automation and basis functions

“Smart Cadastre”

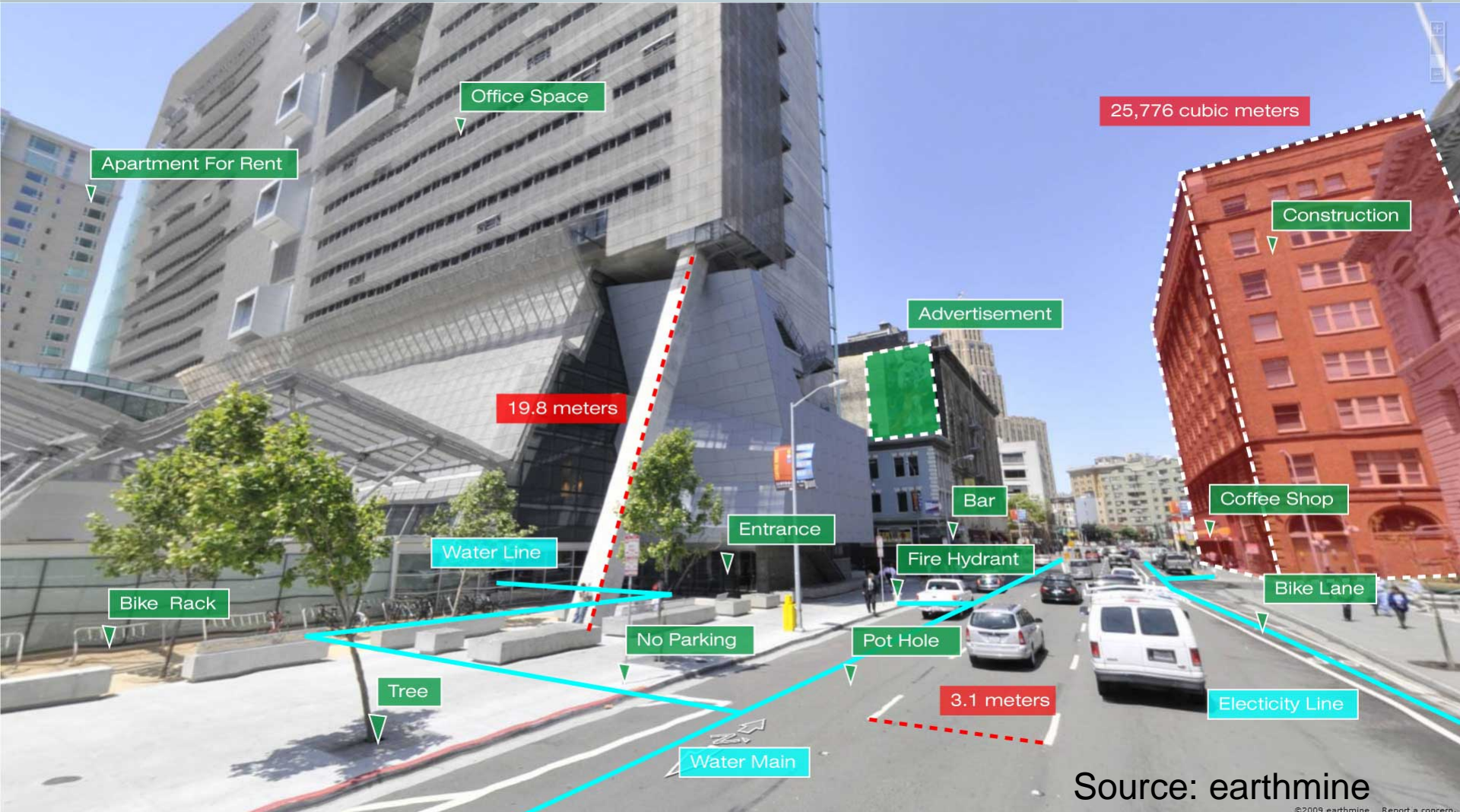
- There will be 3 main trusts in the realisation of “Smart Cadastre”
 - establishment of comprehensive data model to capture all cadastral survey related data that support 3D parcels, capture historical data (4D) with various accuracy (5D).
 - establish the 3D GIS and 3D plan requirements for 3D parcel submission
 - introduce automation in cadastral job processing and adopt LandXML that support 3D in data exchange

What's Next?

Vision - Ubiquitous Cadastre



Ubiquitous Cadastre Vision



Source: earthmine

Thank You

