ECONOMIC AND SOCIAL COUNCIL

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Item 7 of the provisional agenda***

INVITED PAPERS

TOPOGRAPHIC – CADASTRAL DATA INTEGRATION ISSUE: THE MALAYSIAN CASE

Submitted by the Department of Survey and Mapping, Malaysia **

Topographic - Cadastral Data Integration Issue : The Malaysian Case

Ahmad Fauzi Nordin
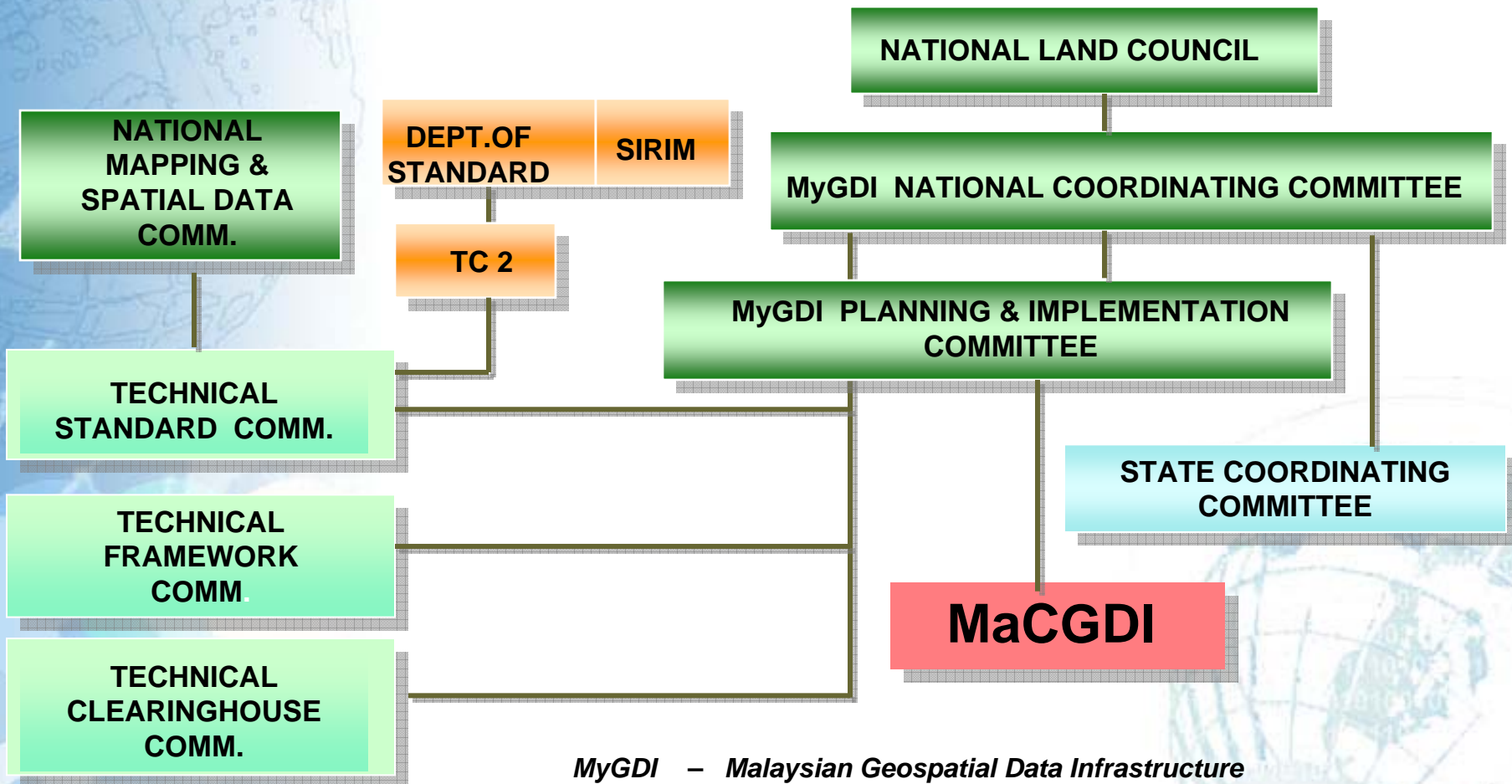*Department of Survey and Mapping*
Malaysia (JUPEM)

Malaysian SDI

❖ **Formed in 1997, then known as NaLIS (National Infrastructure for Land Information System)**

❖ **Purpose :**

  ✓ To promote and facilitate sharing, exchange, dissemination and use of geospatial information among Land Related Agencies (LRAs)

  ✓ To avoid duplication of effort in collection and management of geospatial information

  ✓ To ensure accuracy, timeliness, correctness and consistency of geospatial information

❖ **Undergone restructuring in 2002; subsequently named MyGDI**

MyGDI Management Structure

NATIONAL LAND COUNCIL

NATIONAL MAPPING & SPATIAL DATA COMM.

DEPT.OF STANDARD

SIRIM

MyGDI NATIONAL COORDINATING COMMITTEE

TC 2

MyGDI PLANNING & IMPLEMENTATION COMMITTEE

TECHNICAL STANDARD COMM.

TECHNICAL FRAMEWORK COMM.

STATE COORDINATING COMMITTEE

MaCGDI

TECHNICAL CLEARINGHOUSE COMM.

MyGDI – *Malaysian Geospatial Data Infrastructure*
MaCGDI – *Malaysian Centre for Geospatial Data Infrastructure*
SIRIM - *Standards Research Institute of Malaysia*

Issues of MyGDI Implementation

▶ **Organisational Capacity**

▶ **Training and Education**

▶ **Data Availability and Accessibility**

▶ **Conflicting Interests**

▶ **Data integration**

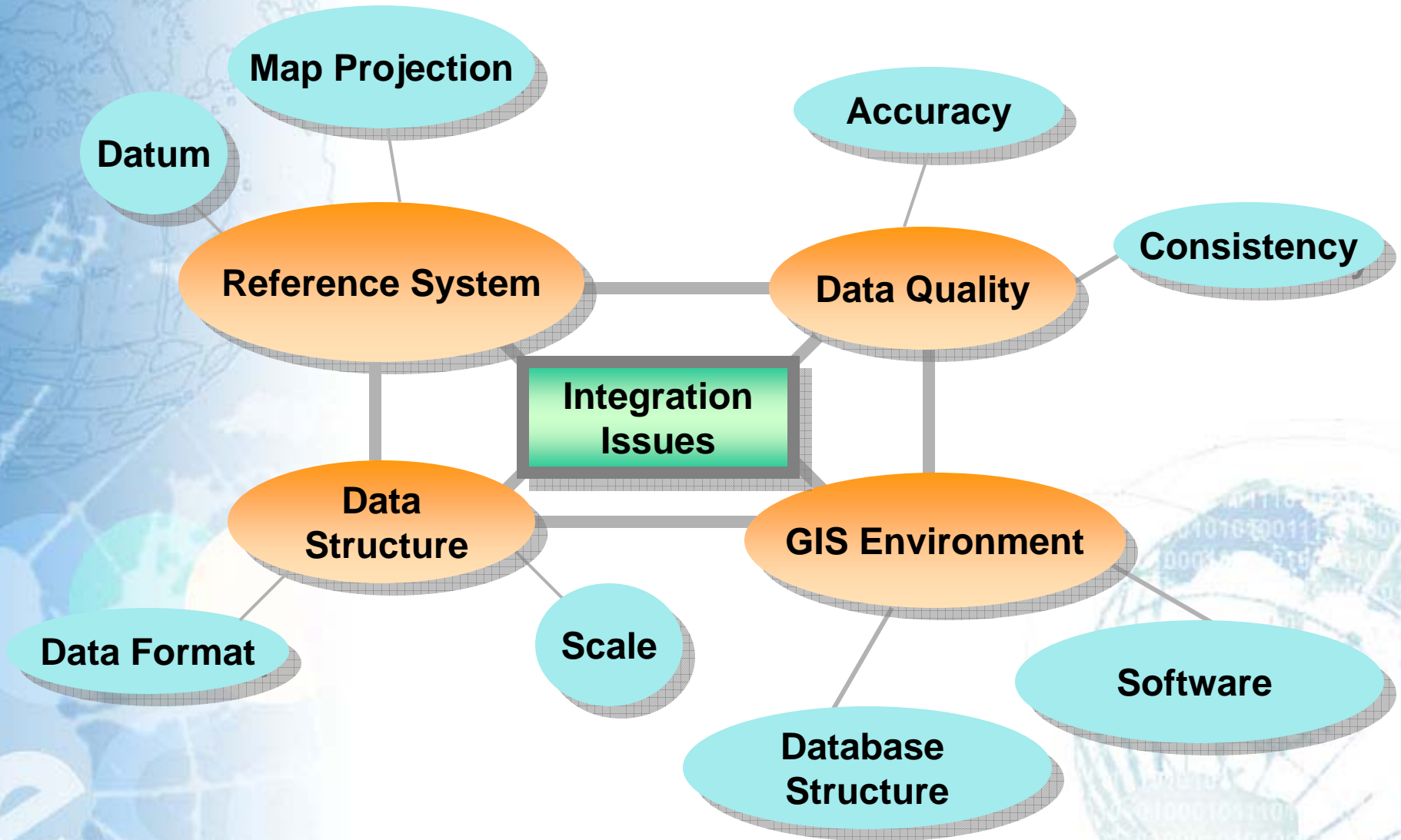# Need for Integration

➢ **Currently, data integration is generally possible but a number of operations need to be performed.**
Outcome – at times are unsatisfactory, particularly in terms of accuracy

➢ **Certain, especially micro/detailed level applications need integration results of higher accuracies. Eg.:**
  ✓ **Determining alignments of new roads & ensuing land acquisition compensations**
  ✓ **Designing of inter-state gas pipelines location & alignment**

➢ **Increased efficiency in data use**

➢ **Wider applicability – increased number of uses & users**

➢ **Better decision making**

➢ **Better economic returns & justification for data provider**
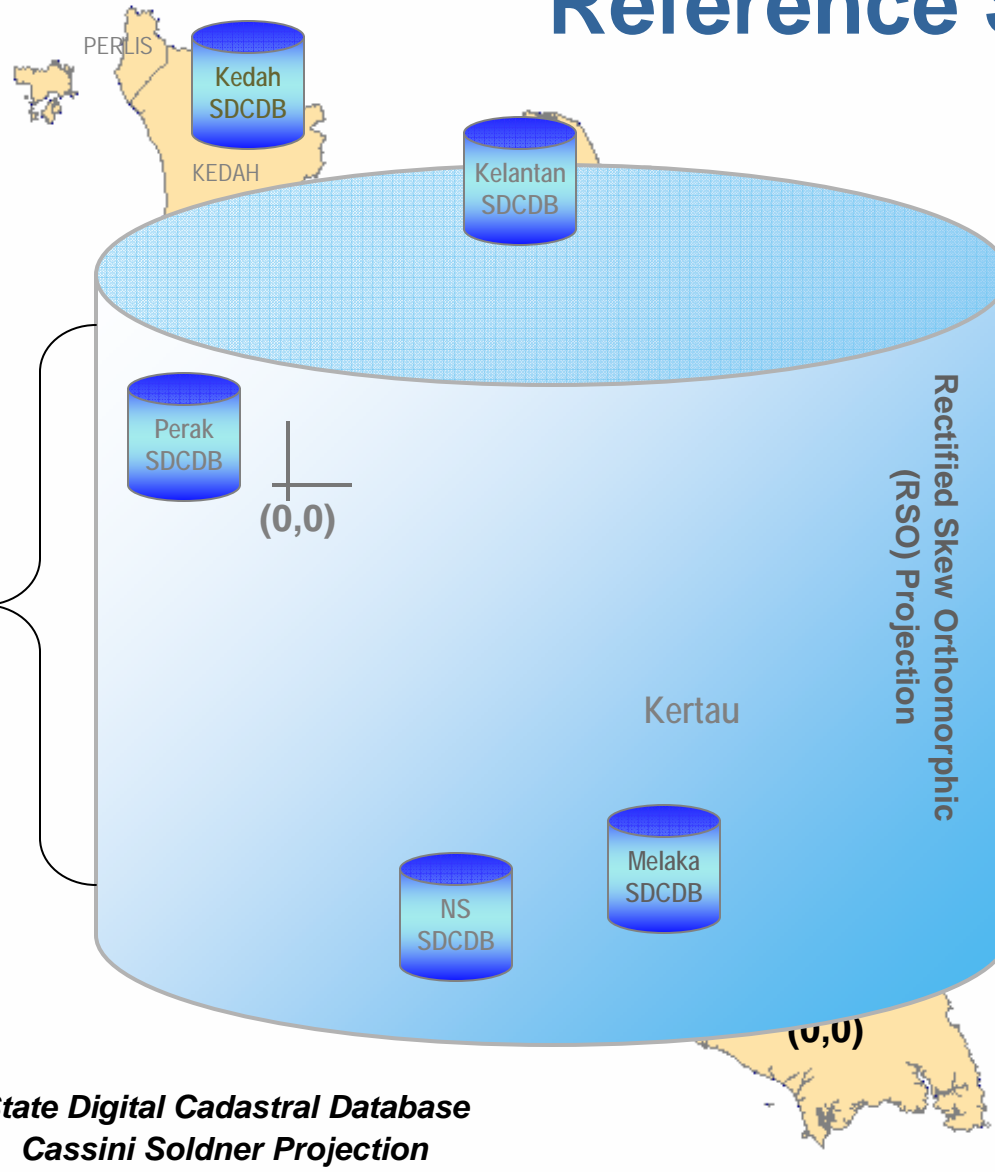
UTM – JUPEM Research Collaboration

➢ **Initiative taken by Department of Survey & Mapping, Malaysia (JUPEM) to address topographic - cadastral data integration**

➢ **Research project undertaken in collaboration with Universiti Teknologi Malaysia (UTM)**

➢ **Successful outcome would help provide solution to the primary issue of data integration since many other datasets are based on topographic datasets (produced by JUPEM)**

➢ **The main objective is to develop techniques for effective integration of data from DTDB & DCDB**

Reference Systems

NATIONAL DIGITAL TOPOGRAPHIC DATABASE (NDTDB)

Rectified Skew Orthomorphic (RSO) Projection

PERLIS

Kedah SDCDB

KEDAH

Kelantan SDCDB

Perak SDCDB

(0,0)

Kertau

NS SDCDB

Melaka SDCDB

(0,0)

SDCDB *State Digital Cadastral Database*
Cassini Soldner Projection

Data Format & DB Structure

Topographic Dataset	Cadastral Dataset

☑ Data acquisition through aerial photography & photogrammetric processes
☑ Data Format
   • Originally uses CAD / DXF
   • Good for graphic display
   • No topology; not GIS ready
☑ Data Structure
   • Arranged according to features, in 10 main layers (sub layers also developed)
   • Migration to OODB using LASERSCAN's LAMPS GOTHIC database
 	
☑ Scale
   • 1: 3000 - 1: 12 500, 1: 25 000, 1: 50 000
	☑ Ground land survey
	☑ Data Format
	   • Uses ARCINFO's Shapefile
	   • Lacks topology (connectivity & adjacency)
	   • Not fully GIS ready
	☑ Data Structure
	   • Makes use of 3 layers, LOT (polygon), BOUNDARY (line), & BDY STONES (point)
	   • High level spatial analyses could not be performed.
	☑ Scale
	   • Survey accurate (keyed-in survey data)
	   • Scale free

Data Quality

- **Accuracy of data from NDTDB :**

Map Scale	Accuracy		
	X (m)	Y (m)	Z (m)
1: 3 000	± 1.5	± 1.5	± 2.5
1: 25 000	± 5.0	± 5.0	± 10.0
1: 50 000	± 12.5	± 12.5	± 20.0

- **Cadastral dataset from DCDB result from ground surveys according to survey classes, i.e: 1st class @1: 8000 & 2nd class @ 1: 4000**
- **For DCDB - high consistency, due to regimented methods of data collection, processing & quality control to fulfill legal requirements. For NDTDB data - inconsistent due to photogrammetric & cartographic processes**
- **Differences in dates of data collection & updating will also affect data integration results**

Research Outcome

- **Techniques for effective data integration**

- **Recommendations** :

  - **Adopt geocentric datum for topographic mapping & cadastral survey systems**

  - **Adopt RSO projection system as well for cadastral survey systems**

  - **Implement Coordinated Cadastral System (CCS)**

  - **Etc.**

Initiatives Impacting Data Integration

❖ **Development of Standard Metadata**
- ▪ **Effort made by the Standards Technical Committee**
- ▪ **Template developed by MaCGDI**
- ▪ **Consistent metadata management tool based on ISO/TC 211 standard**
- ▪ **Can be used for all data categories**
- ▪ **Documented and provided to all data providers**
- ▪ **Free metadata publishing and searching through MyGDI**

❖ **Development of Malaysian Standard (MS1759) Feature & Attribute Codes**
- ▪ **Took into consideration the need to use a standard code for common features in both topographic and cadastral databases.**
- ▪ **Documented and published in 2004**

Initiatives Impacting Data Integration

❖ **Adoption of Geocentric Datum for Mapping**

  ▪ **Move to geocentric datum with launching of GDM 2000 (Geocentric Datum of Malaysia) in 2004**
  ▪ **Based on ITRF 2000 & GRS 1980 reference ellipsoid**
  ▪ **Will simplify & aid integration of geospatial datasets**
  ▪ **Migration of topographic datasets still underway**

❖ **Change from CAD-based to GIS-based NDTDB**

  ▪ **Currently moving to object-oriented database (GINIS to LAMPS-GOTHIC)**
  ▪ **Data - GIS ready**
  ▪ **Migration – still ongoing**
  ▪ **Data structure – changed to comply with MS 1759 (Malaysian Standard)**

Future Plan

Implementation of Coordinated Cadastral System (CCS)

➢ **Cadastral survey system in all States will adopt geocentric datum**

➢ **Adoption of RSO projection system coordinates (to supplement Cassini-Soldner)**

➢ **State DCDB (SDCDB) will be referenced to a single origin & simultaneous formation of a National DCDB (NDCDB)**

➢ **NDCDB – fully GIS ready**

➢ **Implementation will begin in 2007 under the 9th Malaysian Development Plan (2006 – 2010)**
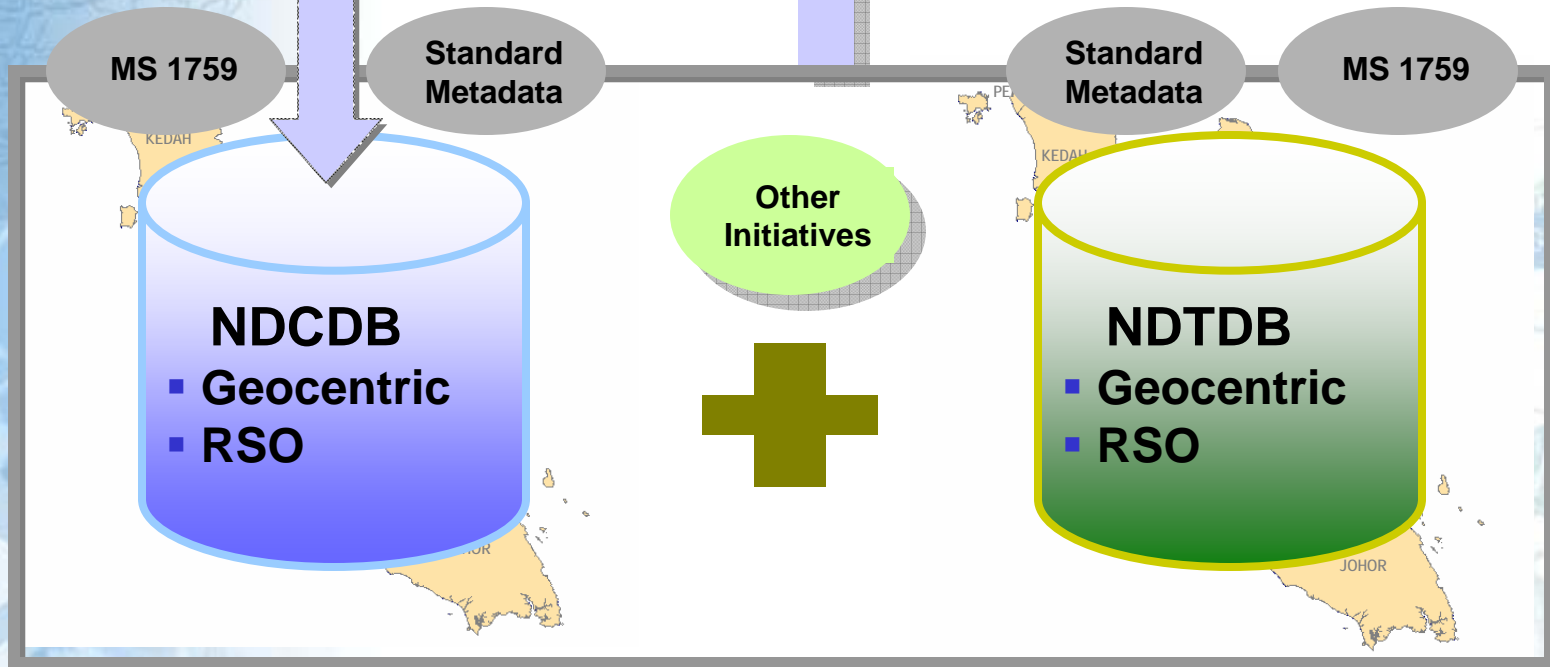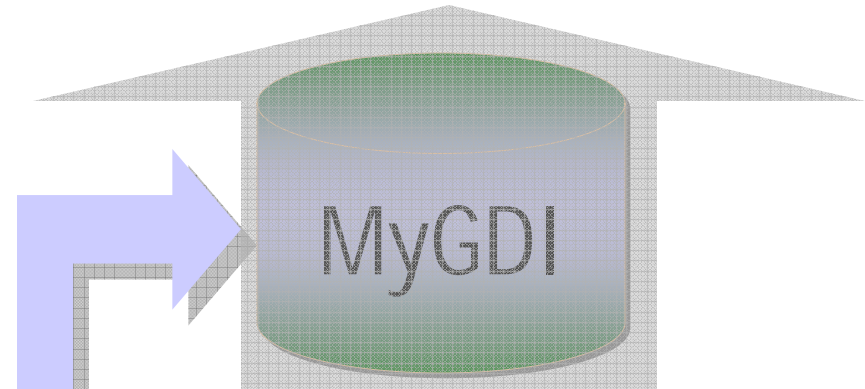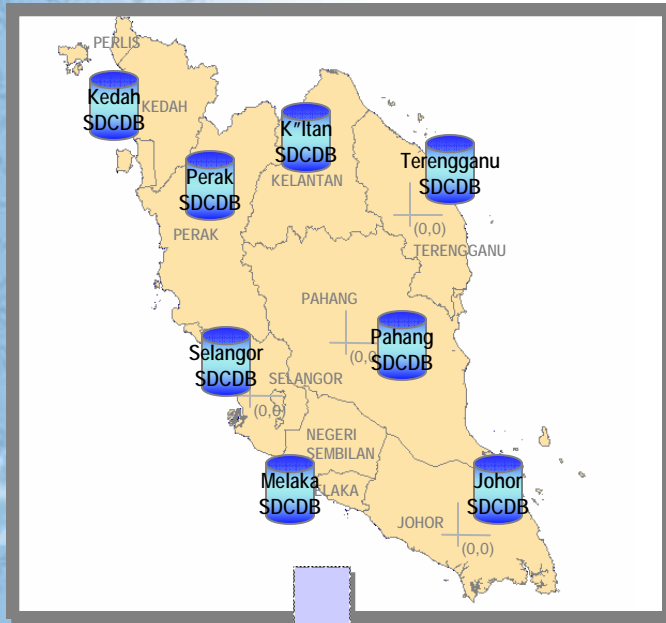
CONCLUSION

- Topographic – cadastral data integration is one of the major issues in MyGDI implementation

- Some initiatives have been undertaken & some underway, in order to address associated problems, especially technical ones

- Overcoming topographic – cadastral data integration problem will bring significant benefits, in particular to geospatial data users