GEOGRAPHIC INFORMATION SYSTEM (GIS) STANDARDISATION IN MALAYSIA

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Malaysian Agricultural Research and Development Institute (MARDI)
Member of TC/G/2
GIS - merging diverse information

Diverse:
- information types
- formats
- perspectives

Distributed

Integrated by location
The vector GIS builds a model of the real world from points, lines, and regions. Points are positioned according to a location reference system such as latitude-longitude, UTM, or SPC. The application determines the level of precision.
Imagery and gridded data

IKONOS

LANDSAT

RADAR IMAGING

N2 Map of block 6 and 7 Seberang Perai
Di sediakan oleh:
Hasliana
1:12,000
Interoperability ...

As defined by ISO TC 211

- the ability to **find** information and processing tools, when they are needed, no matter where they are physically located
- the ability to **understand and employ** the discovered information and tools, no matter what platform supports them, whether local or remote
- the ability to **participate in a healthy marketplace**, where **goods and services are responsive to the needs of consumers**

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The Need for Interoperability

• Geographic analysis
  – Multiple sources, multiple organizations
  – Distributed within a community
  – GIS is unique in merging diverse information

• Enterprise GIS
  – GIS evolving beyond isolated communities
  – GIS merging with broader IT infrastructures

• Web Services
  – Enabled by distributed networks

• E-Government
  – Within government (G2G)
  – Between citizens and government (G2C)
  – Between business and government (B2G)

• Spatial Data Infrastructures

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Interoperability enablers

Supportive networks, Interfaces, hardware

- Practical, widely used
- Providing technical and semantic interoperability
- Fit for purpose
  - Geographic structures
  - Data formats
  - Content description
  - Quality
  - Data management
  - Visualization
  - Geoweb services
  - Metadata

Knowledgeable users
- Well trained
- Understand the need for quality
- Metadata to understand and use data and services properly

Interoperability

Standards

Laws

Intellectual property protection, Authorization to share
Standards
As defined by ISO
http://www.iso.ch

• Documented agreements:
  – **Technical specifications** or precise criteria
  – Rules, guidelines, definitions of characteristics
    • Ensuring materials, products, processes and services are fit for purpose
  – **Reference documents** used in public contracts or international trade
    • Indisputable reference **clarifying the contractual relations** between economic partners

• **Promote competition, commerce and free trade**

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Standards & Specifications

• Make things work – affect every aspect of life
• Widespread use of Standards
  – Make things work around the world
  – Increase efficiency - globally
  – Enable global interoperability

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International Organization for Standardization

• ISO from Greek ISOS meaning “equal”
• Founded in 1947
• 146 member nations
  – 1 member per country (represented through national standards organization – ANSI, DIN, SABS, Standard Malaysia etc)
  – 13700 standards, 3000 technical bodies, 30000 experts
• NGO – unlike UN
  – Delegates not national governments
  – May be mandated by government
  – Roots in private sector and industry associations
• Able to bridge the gap
  – Consensus solutions meeting requirements of business and broader needs of society

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ISO Committees and the Geographic Community

- ISO/IEC JTC 1/SC 24 Computer graphics and image processing
- ISO/IEC JTC 1/SC 32 Data Management and Interchange
- ISO/IEC JTC 1/SC 35 User interfaces
- ISO/TC 20 /SC 13 Space data and information transfer systems
- ISO/TC 23/SC 19 Agricultural electronics
- ISO/TC 46/WG 2 - Coding of country names and related entities
- ISO/TC 82 Mining
- ISO/TC 130 Graphic Technology
- ISO/TC 204 Transport Information and Control Systems (WG3 GDF)
- **ISO/TC 211 Geographic Information/Geomatics**

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ISO/TC 211
Geographic Information/Geomatics

... building the foundation of the geospatial infrastructure, brick by brick ...
### Who Are We? ...Member List

**Active Members (P-members), 29 Countries**

<table>
<thead>
<tr>
<th>Australia</th>
<th>Italy</th>
<th>Saudi Arabia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Japan</td>
<td>South Africa</td>
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<tr>
<td>Belgium</td>
<td>Republic of Korea</td>
<td>Spain</td>
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<td>Canada</td>
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<td>Sweden</td>
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<td>China</td>
<td>Morocco</td>
<td>Switzerland</td>
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<td>Czech Rep.</td>
<td>New Zealand</td>
<td>Thailand</td>
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<td>Finland</td>
<td>Portugal</td>
<td>United Kingdom</td>
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<tr>
<td>Germany</td>
<td>Russian Federation</td>
<td>United States of America</td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td>Yugoslavia</td>
</tr>
</tbody>
</table>
Scope of ISO/TC 211

• Standardization in the field of digital geographic information.
• This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth.
• These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations.
• This work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data.

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ISO/TC 211 Organization

Chairman
Olaf Østensen
Secretary
Bjørnhild Sæterøy
Norway

AG Strategy

AG Outreach
MHT

AG WSI

TMG

TF 211/204

WG 4
Morten Borrebæk
Norway

WG 6
Douglas O’Brien
Canada

WG 7
Antony Cooper
South Africa

WG 8
John Rowley
UK

WG 9
Hiroshi Imai
Japan

Geospatial services

Imagery

Information communities

Location based services

Information management

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<table>
<thead>
<tr>
<th>MS ISO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>19101 : 2003</td>
<td>GI- Reference Model</td>
</tr>
<tr>
<td>19103 : 2006</td>
<td>GI- Conceptual Schema Language</td>
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<tr>
<td>19105 : 2002</td>
<td>GI- Conformance and Testing</td>
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<tr>
<td>19106 : 2006</td>
<td>GI- Profiles</td>
</tr>
<tr>
<td>19107 : 2007</td>
<td>GI- Spatial Schema</td>
</tr>
<tr>
<td>19108 : 2003</td>
<td>GI- Temporal Schema</td>
</tr>
<tr>
<td>19109 : 2007</td>
<td>GI- Rules For Application Schema</td>
</tr>
<tr>
<td>19110 : 2006</td>
<td>GI- Methodology for feature cataloguing</td>
</tr>
<tr>
<td>19111 : 2008</td>
<td>GI- Spatial Referencing By Coordinates (First Revision)</td>
</tr>
<tr>
<td>19111-2 : 2011</td>
<td>GI- Spatial Referencing By Coordinates – Part 2 : Extension For Parametric Values</td>
</tr>
<tr>
<td>19112 : 2006</td>
<td>GI- Spatial Referencing by Geographic Identifiers</td>
</tr>
<tr>
<td>19113 : 2003</td>
<td>GI- Quality Principles</td>
</tr>
<tr>
<td>19114 : 2006</td>
<td>GI- Quality Evaluation Procedures</td>
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<tr>
<td>19115 : 2003</td>
<td>GI- Metadata Referencing by Coordinates</td>
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<tr>
<td>19115-2 : 2011</td>
<td>GI- Metadata – Part 2 : Extension For Imagery And Gridded Data</td>
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<td>19116 : 2006</td>
<td>GI- Positioning Services</td>
</tr>
<tr>
<td>19117 : 2006</td>
<td>GI- Potrayal</td>
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<td>19118 : 2006</td>
<td>GI- Encoding</td>
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<td>19119 : 2006</td>
<td>GI- Services</td>
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<tr>
<td>19123 : 2007</td>
<td>GI- Schema For Coverage Geometry And Functions</td>
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<td>19125-1 : 2006</td>
<td>GI- Simple feature access – Part 1 : Common architecture</td>
</tr>
<tr>
<td>19125-2 : 2006</td>
<td>GI- Simple feature access- Part 2: SQL option</td>
</tr>
<tr>
<td>19128 : 2007</td>
<td>GI- Web Map Server Interface</td>
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<tr>
<td>19131 : 2009</td>
<td>GI- Data Product Specifications</td>
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<tr>
<td>19133 : 2007</td>
<td>GI- Location-based Services - Tracking And Navigation</td>
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<tr>
<td>19135 : 2007</td>
<td>GI- Procedures For Item Registration</td>
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<tr>
<td>19136 : 2008</td>
<td>GI- Geography Markup Language (GML)</td>
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<td>19137 : 2008</td>
<td>GI- Core Profile Of The Spatial Schema</td>
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<tr>
<td>19141 : 2009</td>
<td>GI- Schema For Moving Features</td>
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<tr>
<td>19144-1 : 2011</td>
<td>GI – Classification System-Part 1: Classification System Structures</td>
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<tr>
<td>MS ISO/TS</td>
<td>GI- Geodetics Codes and Parameters</td>
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<td>19127 : 2006</td>
<td>GI- Geodetics Codes and Parameters</td>
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<tr>
<td>19134 : 2008</td>
<td>GI- Location- Based Services - Multimodal Routing and Navigation</td>
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<tr>
<td>19138 : 2008</td>
<td>GI- Data Quality Measures</td>
</tr>
<tr>
<td>19139 : 2008</td>
<td>GI- Metadata - XML Schema Implementation</td>
</tr>
</tbody>
</table>
GI Standards In Malaysia

• Department of Standards Malaysia (DSM) and SIRIM are responsible for the development and application of standards-related products, in partnership with the community, business and government; and rely on voluntary participation by experts.

• DSM also represents Malaysia in ISO/TC 211- GI and has a policy of endorsing and adopting International Standards wherever possible.

• GI- Standard, the Joint Technical Committee for Geographic information/Geomatics (also known as TC/G/2) is dedicated to developing standards for geographic information and associated technologies.
MyGDI Management Structure

- NATIONAL MAPPING & SPATIAL DATA COMM.
- DEPT. OF STANDARD
- SIRIM
- TC 2
- MyGDI NATIONAL COORDINATING COMMITTEE
- MyGDI PLANNING & IMPLEMENTATION COMMITTEE
- STATE COORDINATING COMMITTEE
- MaCGDI

MyGDI – Malaysian Geospatial Data Infrastructure
MaCGDI – Malaysian Centre for Geospatial Data Infrastructure
SIRIM – Standards Research Institute of Malaysia
<table>
<thead>
<tr>
<th>BIL</th>
<th>MS</th>
<th>GEOGRAPHIC INFORMATION (GI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MS 1759 : 2004/2015</td>
<td>GI- Features and Attribute Codes</td>
</tr>
<tr>
<td>2</td>
<td>MS 1987 : 2007</td>
<td>GI- Route Numbering System and Guide Signs</td>
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<tr>
<td>3</td>
<td>MS 2256 : 2009</td>
<td>GI- Guidelines For The Determination Of Geographical Names</td>
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<tr>
<td>4</td>
<td>MS 2039 : 2006</td>
<td>GI- Addresses Standard Format –Requirements</td>
</tr>
<tr>
<td>5</td>
<td>Working draft</td>
<td>GI- Malaysian Geospatial Metadata Standard (MGMS)</td>
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</table>
MS 1759:2015
GI- Features and Attribute Codes
FOREWORD

This Malaysian Standard (MS 1759:2015) was developed by the Technical Committee on Geographic Information/Geomatics under the authority of the Information Technology, Telecommunications and Multimedia Industry Standards Committee based on the working draft prepared by the Technical Standards Committee of the Malaysian Geospatial Data Infrastructure (MyGDI).

This Standard cancels and replaces MS 1074:1992 Malaysian Standard Code of Practice for the Exchange of Digital Feature Coded Mapping Data and MS1759:2004 GI- Features and Attribute Codes
NORMATIVE REFERENCES

The following normative references for the application of this standard:

- ISO/DIS 19104: Geographic information/Geomatics - Terminology
- ISO/DIS 19110: Geographic information/Geomatics – Methodology for feature cataloguing
- DIGEST Part 4 – Feature and Attribute Coding Catalogue (FACC)
- National Land Code (1965)
- Laws of Sarawak, Land Code
- Sabah Land Ordinance (1930)
What is MS1759?
describes the encoding of the real world in terms of features and attributes.

provides the specification by which data producers and users may sharing and exchange digital spatial data to minimize the possibility of duplication of effort in database development.

There are twelve (12) categories data applied in this MS 1759:2015
Features are real world objects while attributes are properties or characteristics associated with the objects.

Features is identified by a unique six character codes. The first character corresponds to the feature category and can have an alphabetic value from A through Z.

Attributes are used to describe characteristics of a feature which is using attribute codes to represent the category of information.
MS 1759 STRUCTURE

Aeronautical

Air Space

Aerodrome

Airfield

Aerodrome Control Tower

Aerodrome Beacon

NAM

Category

Sub Category

Feature

Attribute
## MS 1759 CATEGORIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Aeronautical</td>
</tr>
<tr>
<td>B</td>
<td>Built Environment</td>
</tr>
<tr>
<td>D</td>
<td>Demarcation</td>
</tr>
<tr>
<td>G</td>
<td>Geology</td>
</tr>
<tr>
<td>H</td>
<td>Hydrography</td>
</tr>
<tr>
<td>R</td>
<td>Hypsography</td>
</tr>
<tr>
<td>S</td>
<td>Soil</td>
</tr>
<tr>
<td>T</td>
<td>Transportation</td>
</tr>
<tr>
<td>U</td>
<td>Utility</td>
</tr>
<tr>
<td>V</td>
<td>Vegetation</td>
</tr>
<tr>
<td>X</td>
<td>Special Use</td>
</tr>
<tr>
<td>Z</td>
<td>General</td>
</tr>
</tbody>
</table>
**Sub Category Feature**

- **D-Demarcation**
  - DA  Topographic
  - DB  Maritime
  - DC  Cadastral
  - DD  Planning Land Use

- **G-Geology**
  - GA  Geolithology
  - GB  Mineral
  - GC  Fossils
  - GD  Mining
  - GE  Exploration
  - GF  Geological Features
  - GG  Geoscience
MS 1759 FEATURE

Feature Code: BA0010
Feature Name: Residential Building
Description: Building or property designated for use as premises for dwelling units or home.
Feature Class: Point, Polygon
Possible Attribute: Name (NAM), Area Measured (m²) (ARM), Building Name (BA1), Building Number (BA2), Street Name (BA3), Post Code (BA4), State Name (BA5), Residential Building Type (RET), Number of Storey (NOS), Lift Facilities (LIF), Residential Usage (REU)
FEATURE & ATTRIBUTE

**Feature**

- Feature Code: BA0010
- Feature Name: Residential Building

**Possible attribute**

- Building Number
- Street Name

**Feature Class**

- (Point)
- (Polygon)
This category contains building, property or place designated for use as premises for residential, commercial, industrial, institutional, educational, religious, recreational, cemetery and built up structures.

**Sub Category**
- BA Residential
- BB Commercial
- BC Industrial
- BD Institutional
- BE Educational
- BF Religious
- BG Recreational
- BH Cemetery
- BJ Built-up
HYDROGRAPHY

This category includes geospatial data on coastal, ports, shoreline, fishing facilities, harbours, navigation aids, inland water, river structure, offshore information etc.

Sub Category

- HA Coastal Hydrography
- HB Shoreline Structure
- HC Fishing Facilities
- HD Ports and Harbours
- HE Navigation Aids
- HF Danger and Hazard
- HG Depth Information
- HH Inland Water
- HJ River Structure
- HK Offshore
- HL Island
- HM Miscellaneous
This category contains the geospatial information related to electricity, telecommunication, water supply, oil and gas, sewerage and waste management.

**Sub Category**

- **UA** Electricity
- **UB** Telecommunication
- **UC** Water Supply
- **UD** Oil and Gas
- **UE** Broadcasting
- **UF** Sewerage
- **UG** Waste Management
- **UH** Meteorological
VEGETATION

This category includes geospatial data on agricultural land use activities, boundaries and area of vegetation such as forest, mangrove, wetland, dryland and cropland

Sub Category

- VA Agriculture
- VB Forest
- VC Miscellaneous

Feature Code: VA0000
Feature Name: Agriculture
Description: An area of cultivating the soil, growing and harvesting crops, raising livestock, biofuel and other products used to sustain human life.
Feature Class: Polygon
Possible Attribute: Name (NAM), Area Measured (h) (ARH)
GI - Malaysian Geospatial Metadata Standard (MGMS)
(working draft)
• Metadata is "data that provides information about other data".

• Describing the contents and context of data or data files increases their usefulness.

• The main purpose of metadata is to facilitate in the discovery of relevant information, more often classified as resource discovery.

• Metadata assists in resource discovery by "allowing resources to be found by relevant criteria, identifying resources, bringing similar resources together, distinguishing dissimilar resources, and giving location information."
What IS Metadata?

- title
- supplemental information
- abstract
- time period
- author sources
- (file) size

metadata information Data
METADATA AND GIS MANAGEMENT

The importance of geospatial metadata

- Provides an inventory of data assets
- Helps determine and maintain the value of data
- Helps determine the reliability of data
- Supports decision making
- Documents legal issues
- Helps keep data accurate and helps verify accuracy to support good decision making and cost savings
- Helps determine budgets because it provides a clearer understanding of when or if data needs to be updated or repurchased
Data about data
a. Geographic area covered
b. Date and time
c. Rules of use
d. Positional accuracy
e. Data dictionary
f. Means of encoding
g. Datum
h. Map projection

A Key interoperability technology:
- Producers explain their product
- Users learn about products
The MMSP defines the schema required for describing geographic information and services.

The MMSP is beneficial to:
- Use this document as a guide in metadata preparation and implementation in geospatial databases or datasets.
- Give some idea as a reference document to System Developers.

The MMSP is applicable to:
- Cataloguing of all types of resources, clearinghouse activities and full description of datasets and services.
- Geographic services, geographic datasets, dataset series and geographic features and feature properties.

WHY MALAYSIA GEOSPATIAL METADATA STANDARD (MGMS)
## Comparison Between ISO 19115 and MGMS

<table>
<thead>
<tr>
<th></th>
<th>ISO 19115</th>
<th>MGMS</th>
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</thead>
<tbody>
<tr>
<td><strong>Elements</strong></td>
<td>• 456 (elements in ISO 19115-1:2014)</td>
<td>201 elements (cover for vector, imagery and gridded data, and services information elements)</td>
</tr>
<tr>
<td></td>
<td>• 139 (elements in ISO 19115-2:2011)</td>
<td></td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>International use</td>
<td>Malaysian use</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>Vector and raster metadata elements separated into two documents</td>
<td>Combination of vector and imagery and gridded data metadata elements as single document</td>
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<tr>
<td><strong>System/application</strong></td>
<td>None</td>
<td>MyGDI Explorer</td>
</tr>
<tr>
<td><strong>Data Quality</strong></td>
<td>ISO 19138:2006</td>
<td>Adopt Garis Panduan Data Kualiti Geospatial document</td>
</tr>
</tbody>
</table>
Annex C (Metadata extension and profile) ISO allow extensions to be defined and included where required elements are not available from the within a standard profile. These extensions were required to include customized code lists, adding some new elements and cover off Malaysia specific requirement.

Figure 1: Metadata Community profile
RECOMMENDED CORE METADATA FOR GEOGRAPHIC DATASET

<table>
<thead>
<tr>
<th></th>
<th>Dataset title</th>
<th>Additional extent information (vertical and temporal)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dataset reference date</td>
<td>- Spatial representation type</td>
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<tr>
<td></td>
<td>Dataset responsible party</td>
<td>- Reference system</td>
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<tr>
<td></td>
<td>Geographic location of the dataset (by four coordinates or by geographic identifiers)</td>
<td>- Lineage statement</td>
</tr>
<tr>
<td></td>
<td>Dataset language</td>
<td>- On-line resource</td>
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<td></td>
<td>Dataset character set</td>
<td>- Metadata file identifier</td>
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<td>Dataset topic category</td>
<td>- Metadata standard name</td>
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<td>Spatial Resolution</td>
<td>- Metadata standard version</td>
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<td>Abstract describing the dataset</td>
<td>- Metadata language</td>
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<td>Distribution format</td>
<td>- Metadata character set</td>
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<td>- Metadata point of contact</td>
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<tr>
<td></td>
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<td>- Metadata time stamp</td>
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</tbody>
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SUMMARY

i. GI- Standards is an important component in geospatial system management
ii. Help in data sharing and interoperability
iii. Promote for adopting standard through workshop and seminars
iv. Should be part of syllabus in GIS courses
v. Issues to be address in National Geospatial Master Plan