

Training on “Coordinated Preparation of High-Resolution  
National Foundation Spatial Data (NFSD) for Gram  
Panchyat and Ward Level Mapping  
Bhubaneswar

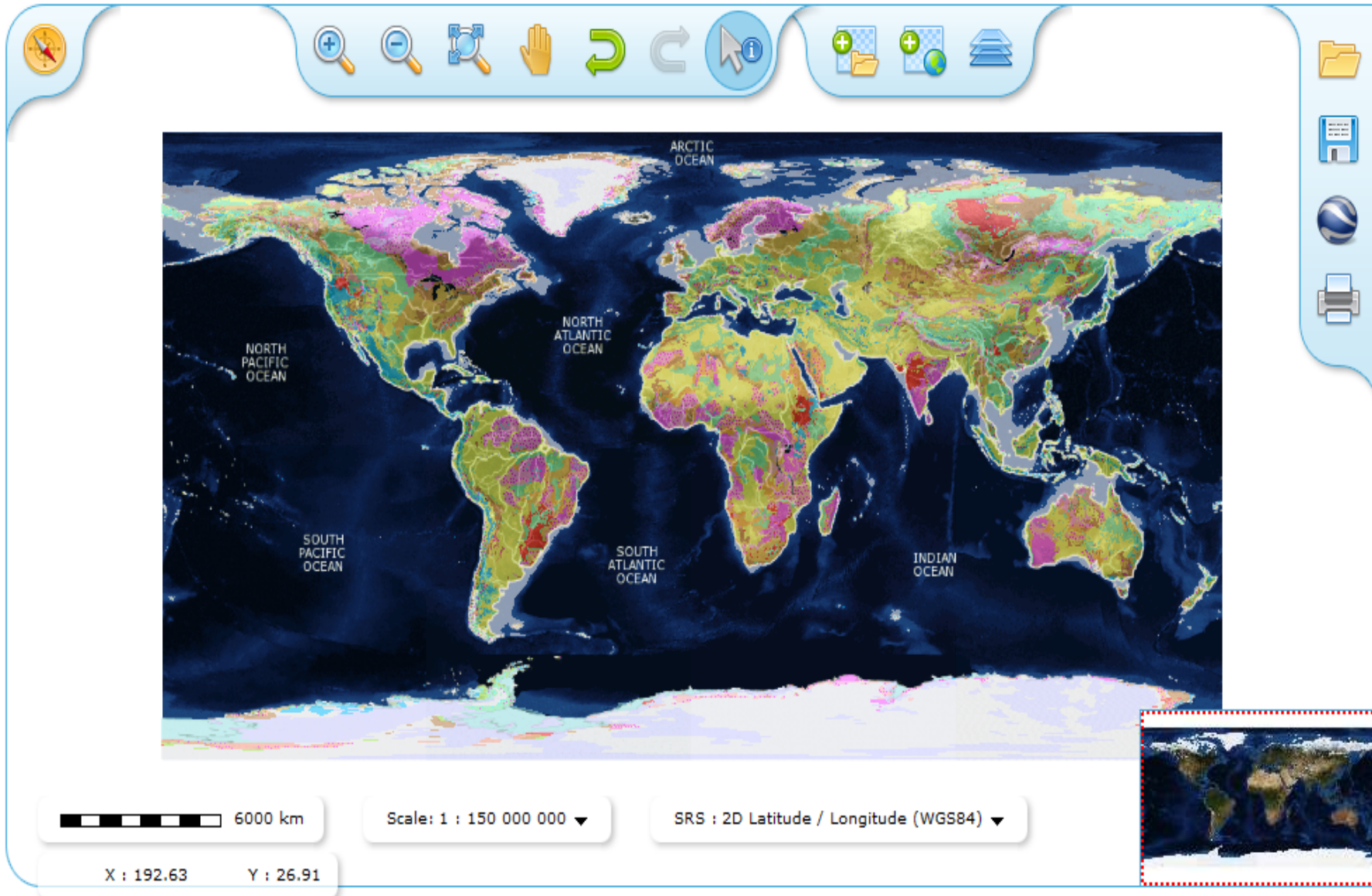
S.K.Bohra  
Former Dy. Director General  
Geological Survey of India

21-12-2018

# **GEOLOGICAL DATA MODELING & Data Registry**

# Onegeology

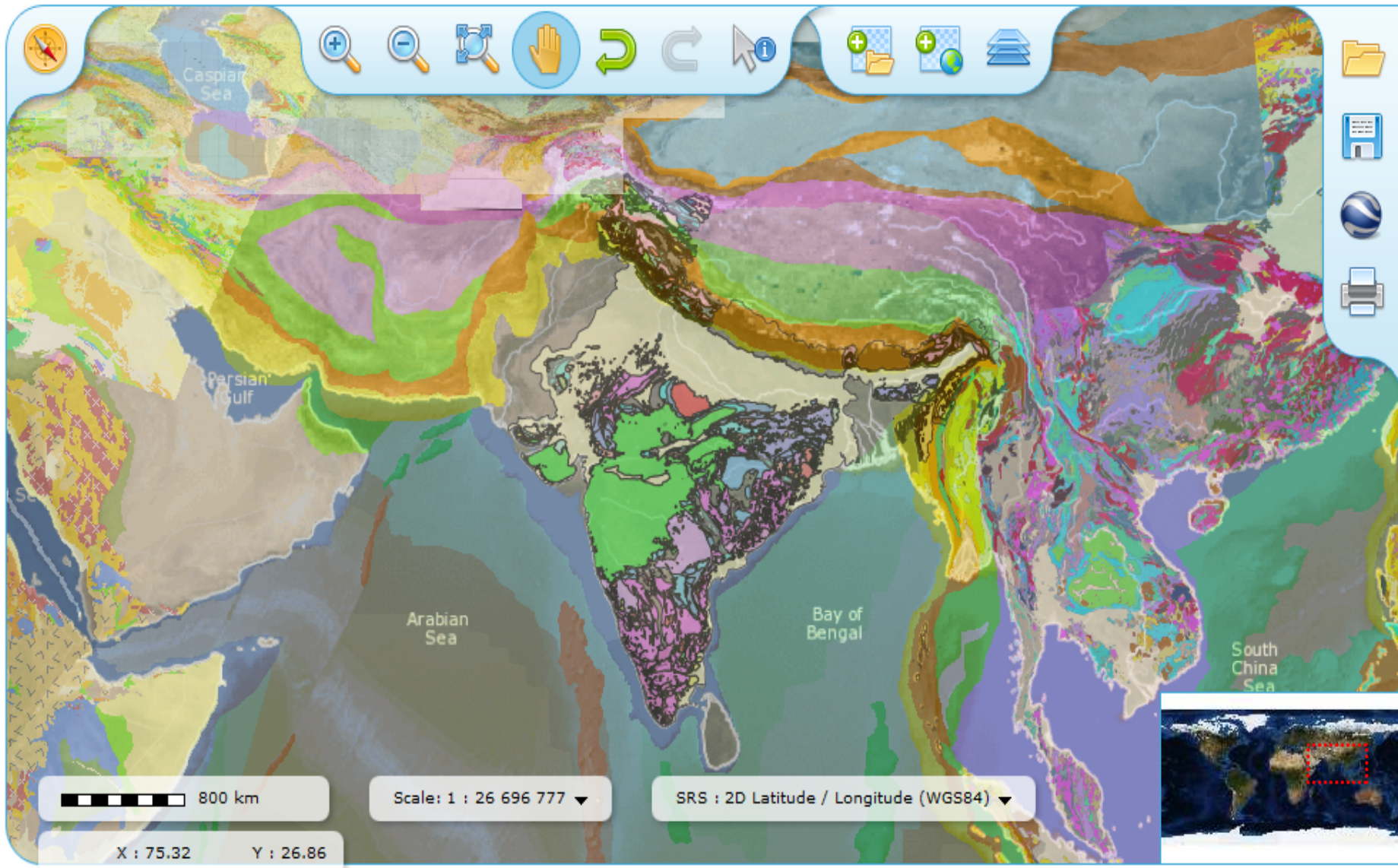
- It is an international collaborative project in the field of geology supported by 113 countries.
- The onegeology portal was launched on 6<sup>th</sup> August 2008 at the 33<sup>rd</sup> IGC in Oslo, Norway.
- View geological map of the world containing over 480 datasets, services and maps.
- Basic map data visible in the onegeology portal is called WMS
- Detailed map data in the onegeology portal is called a WFS which are types of **GeoSciML, a computer interoperable data exchange language.**



The interface features a central world map with geological data layers. The map is surrounded by a toolbar with icons for navigation (compass, zoom in, zoom out, pan, hand, refresh, home, info), layer management (add, remove, layers), and other functions (folder, save, globe, print). Below the map, there is a scale bar (0-6000 km), a scale dropdown (1 : 150 000 000), and an SRS dropdown (2D Latitude / Longitude (WGS84)). A coordinate display shows X : 192.63 and Y : 26.91. A small inset map in the bottom right corner shows the current view area.

**URL: [www.portal.onegeology.org](http://www.portal.onegeology.org)**

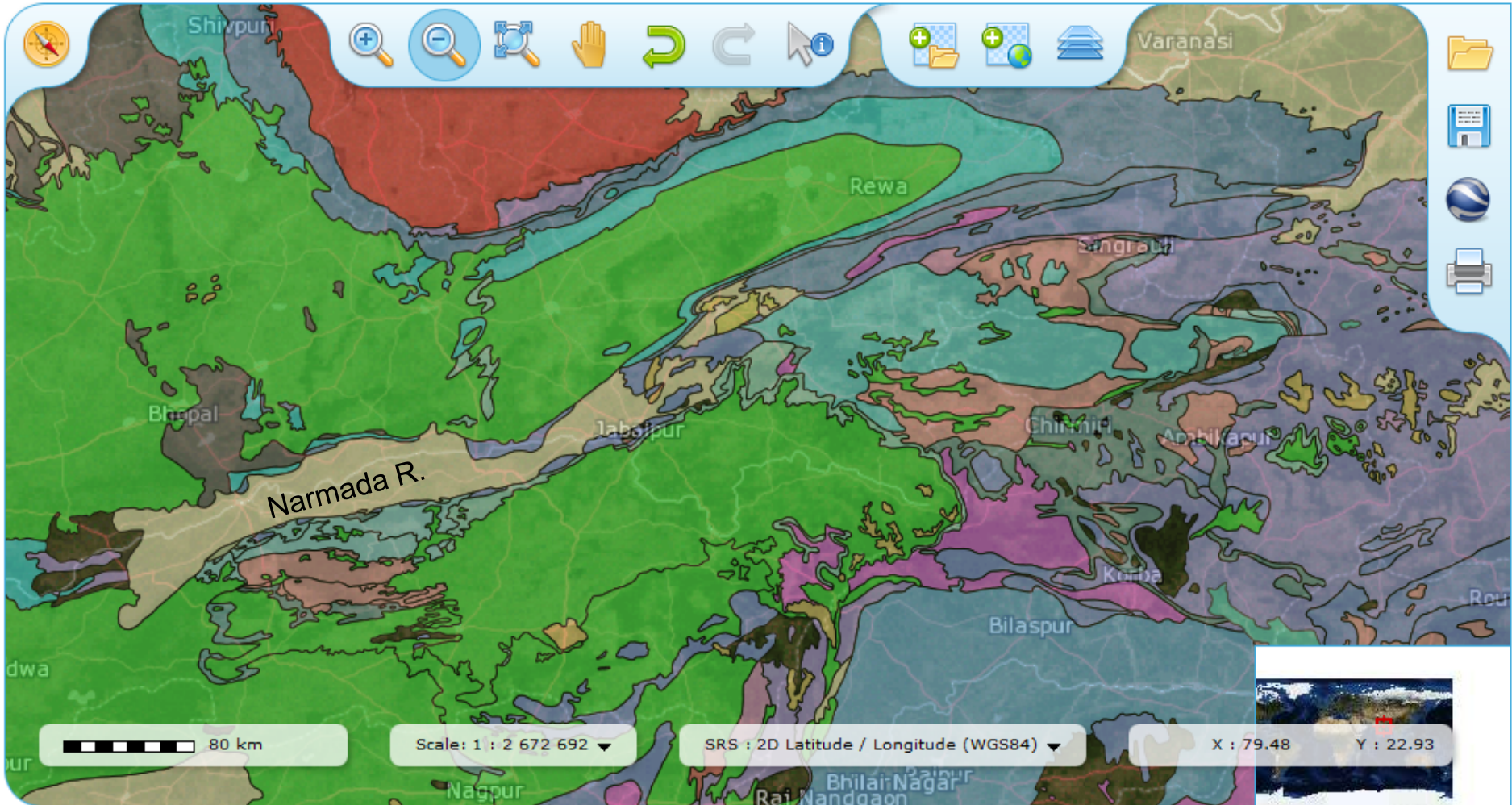


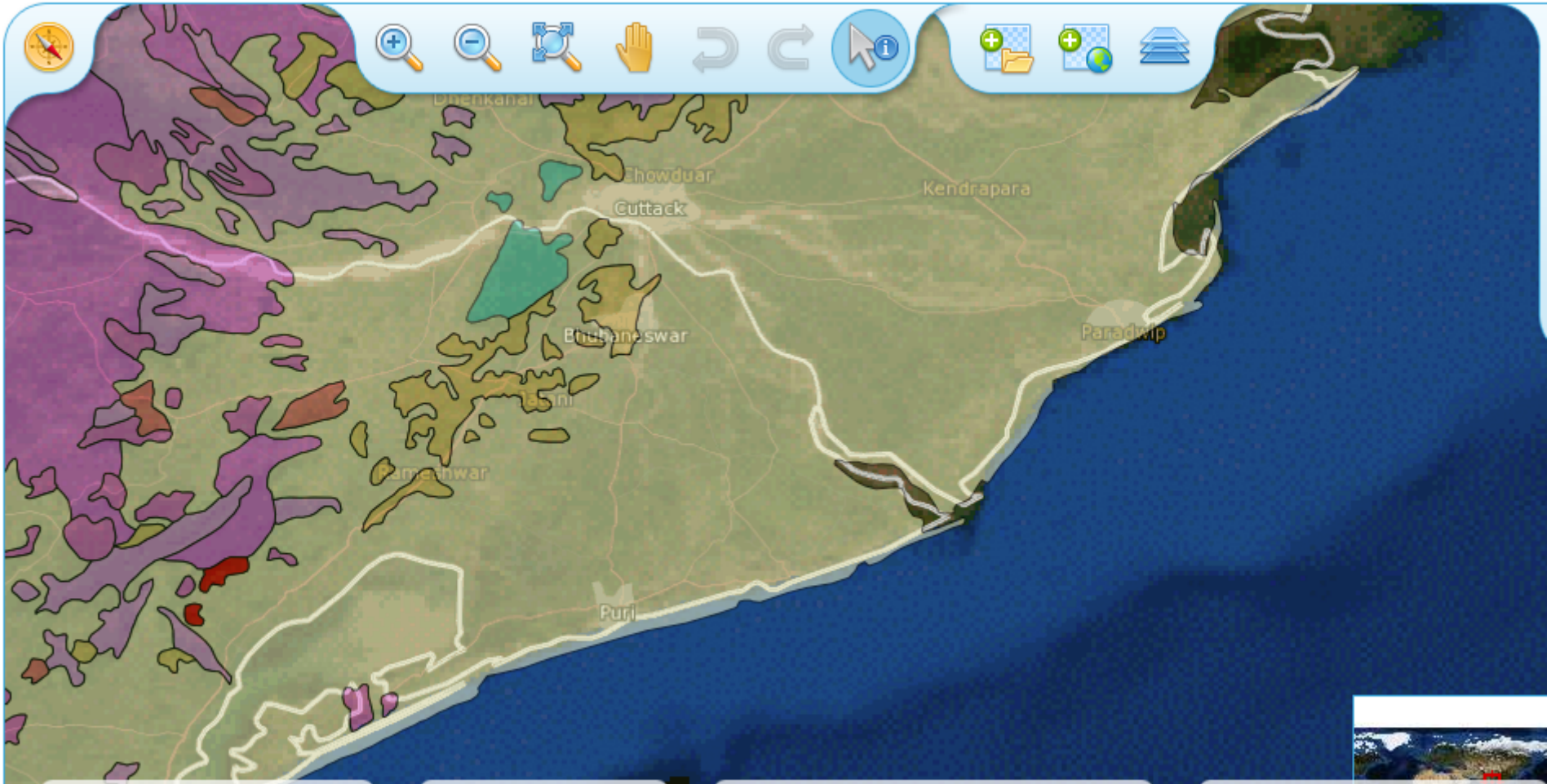






Providing geoscience data globally





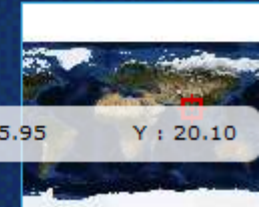
GetFeature Info

IND GSI 1:2M Geology

SRS : 2D Latitude / Longitude (WGS84) ▼

X : 85.95

Y : 20.10



Formation	Age
Undiff.fluvial/aeolian/coastal and glacial sediments	Quaternary



## Registered services

Services ordered by data owner in alphabetical order within UN geographic areas

### Thailand

**Service:** DMR Combined Bedrock and Superficial Geology and Age; **Provider:** Geological Survey of Japan

<http://geodata1.geogrid.org/mapserv>

[/DMR\\_Combined\\_Bedrock\\_and\\_Superficial\\_Geology\\_and\\_Age/wms?](#)

**Datasets:** THA DMR 1:1M Combined Bedrock and Superficial Geology and Age,  
**Owner:** Department of Mineral Resources of Thailand



**Abstract:** Department of Mineral Resources (DMR) of Thailand Map containing the combined bedrock and superficial geology and age. The attribute of each polygon includes the bedrock and superficial geology information and age.

**Access constraints:** *The 1:1M digital map data is available for free download for your personal, teaching, research or non-commercial use as described on the previous web-page. Your use of any information provided by the Department of Mineral Resources (DMR) is at your own risk. Neither DMR gives no warranty, condition or representation as to the quality, accuracy or completeness of the information or its suitability for any use or purpose. All implied conditions relating to the quality or suitability of the information, and all liabilities arising from the supply of the information (including any liability arising in negligence) are excluded to the fullest extent permitted by law.*

## Southern Asia

### India

**Service:** BGS GSI Geology; **Provider:** British Geological Survey

[http://ogc.bgs.ac.uk/cgi-bin/BGS\\_GSI\\_Geology/wms?](http://ogc.bgs.ac.uk/cgi-bin/BGS_GSI_Geology/wms?)

**Datasets:** IND GSI 1:2M Geology, IND GSI 1:2M Faults, IND GSI 1:2M Thrusts,

**Owner:** Geological Survey of India



**Abstract:** The layer is a compilation of surface geology (lithology with super group, Group, Formation and age) within Indian subcontinent compiled in 1:2M scale from basic mapping data generated through 1:50K geological map.

**Access constraints:** *null*

### Iran

**Service:** BGS GSI bedrock and structural geology; **Provider:** British Geological Survey

[http://ogc.bgs.ac.uk/cgi-bin/BGS\\_GSI\\_EN\\_Bedrock\\_and\\_Structural\\_Geology](http://ogc.bgs.ac.uk/cgi-bin/BGS_GSI_EN_Bedrock_and_Structural_Geology)

[/ows?language=eng&](#)

**Datasets:** IRN GSI 1:1M faults, IRN GSI 1:1M bedrock geology,

**Owner:** National Geoscience Database of Iran (NGDIR)



**Abstract:** 1:1,000,000 scale Bedrock and Structural geology of Iran. This map was compiled by: M.R.Sahandi and M.Sohelli, with the contribution of S.Allah Madadai, A.Mohammadi Araghi, and R.Zabihi. The map was digitized and made GIS ready by: M.Sadeghi, T.Delavar, and A.Jafari Rad. Cartography by: A.Malek Ahmadi and M.Sadeghi.

**Access constraints:** *null*



The Solution is “ Inter-operability”

“ the ability of software and hardware on different machines from different vendors to share data”

## Essence of standards

- Precise, unambiguous
- Widely accepted – **involve** users, data agencies, ...
- Consumable by people **AND** Systems
  - Real inter-operability
- Comprehensive
- Extendible
- Query-able
- Proven – create use cases
- OGC brings all users, developers, data providers, tools people together – provability, acceptability

# Structured Digital Data

## Advantages:

- Handles all the information
- Is well-structured
- Allows establishing data exchange standards .
- Suitable for computer analysis and Machine readable

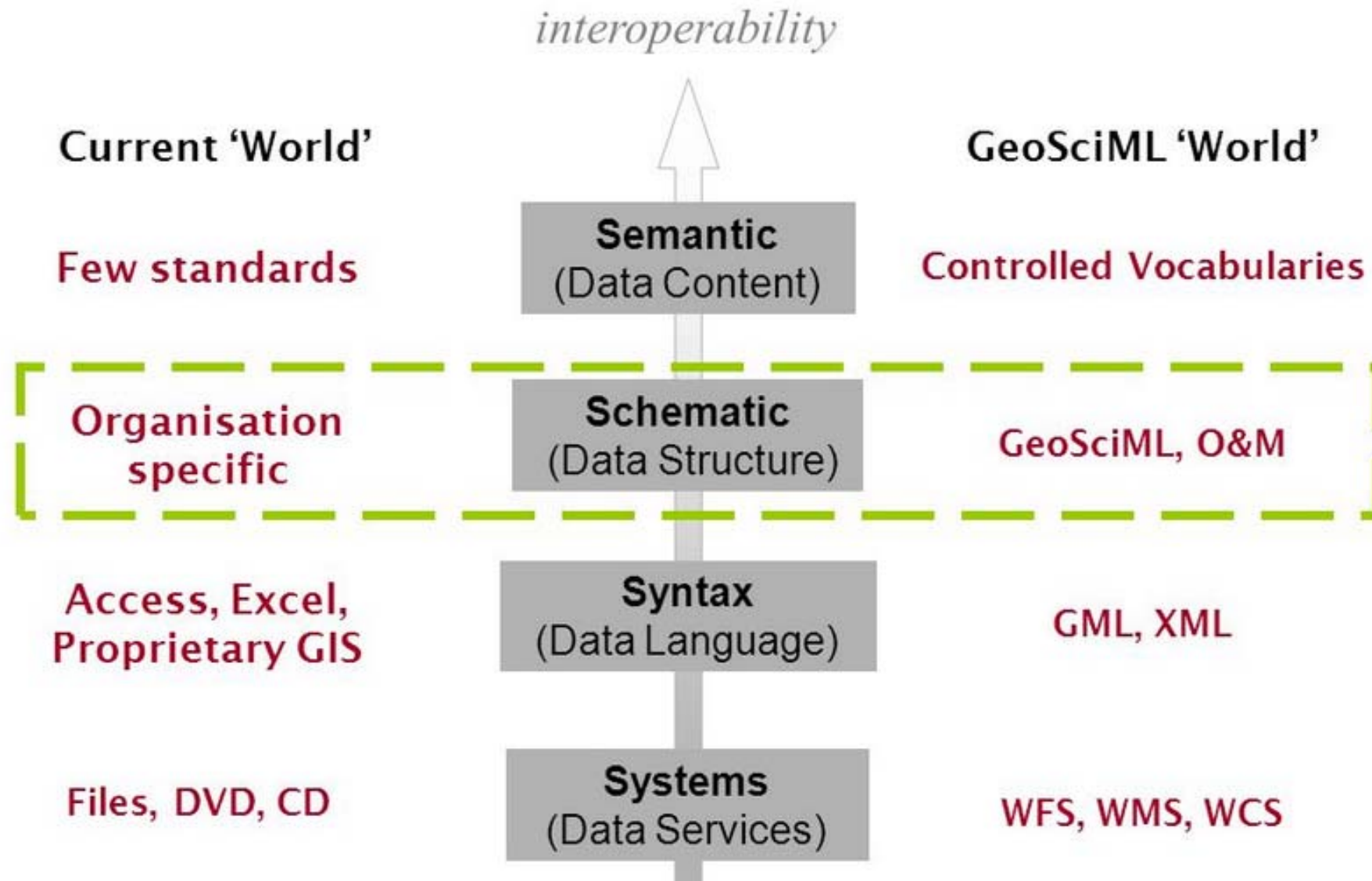
## Disadvantage:

- Requires Agreed Standards

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  <xsd:complexType base="gml:Feature" substitutionGroup="gml:Feature" type="loc:GEOLOGICUNIT" />
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- <xsd:complexContent >
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    <xsd:element name="AGE" minOccurs="0" nillable="true" type="xsd:string" />
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# INTEROPERABILITY REQUIREMENT



# System Agreement

Availability of appropriate technology –OGC, ISO, W3C

Agree to use OGC compliant **Web Map Service (WMS)** – A standard protocol developed by the OGC in 1999 for serving geo-referenced map images over the internet.

These images are produced by a WMS server from the data provided by a GIS database.

**Web Feature Service (WFS)** - A standard protocol developed by the OGC for serving feature data over the internet.

These feature data are produced by a WFF server from the data provided by a GIS database.

# Syntax Agreement

How do you convert standard representation of data model (UML) to standard schema (GML)?

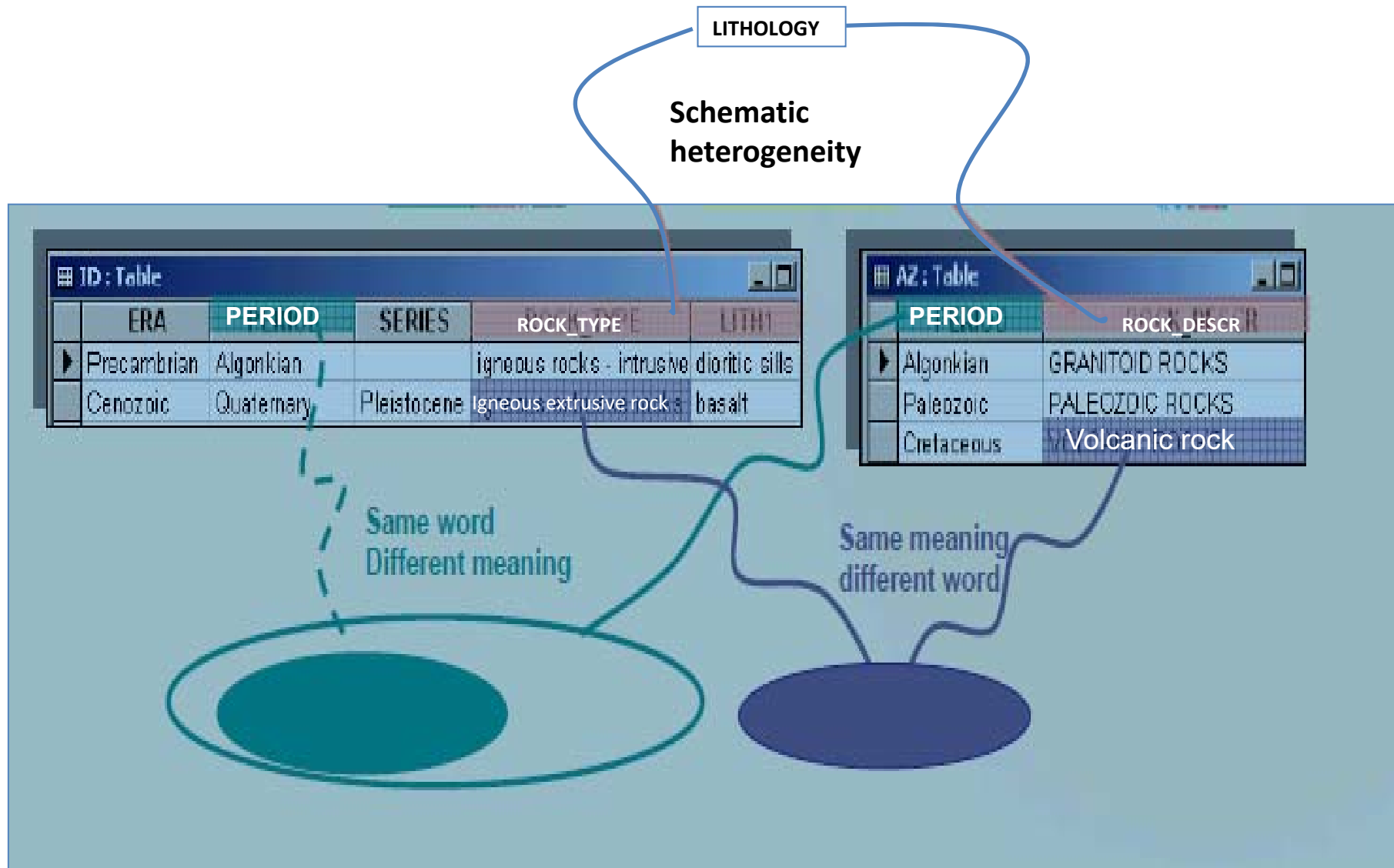
- Need to establish UML rules (association, etc)
- Establish name spaces

Need software to enable generation of XMI, XSD and also DDL file .

**(Enterprise Architect software)**



# Schematic Agreement



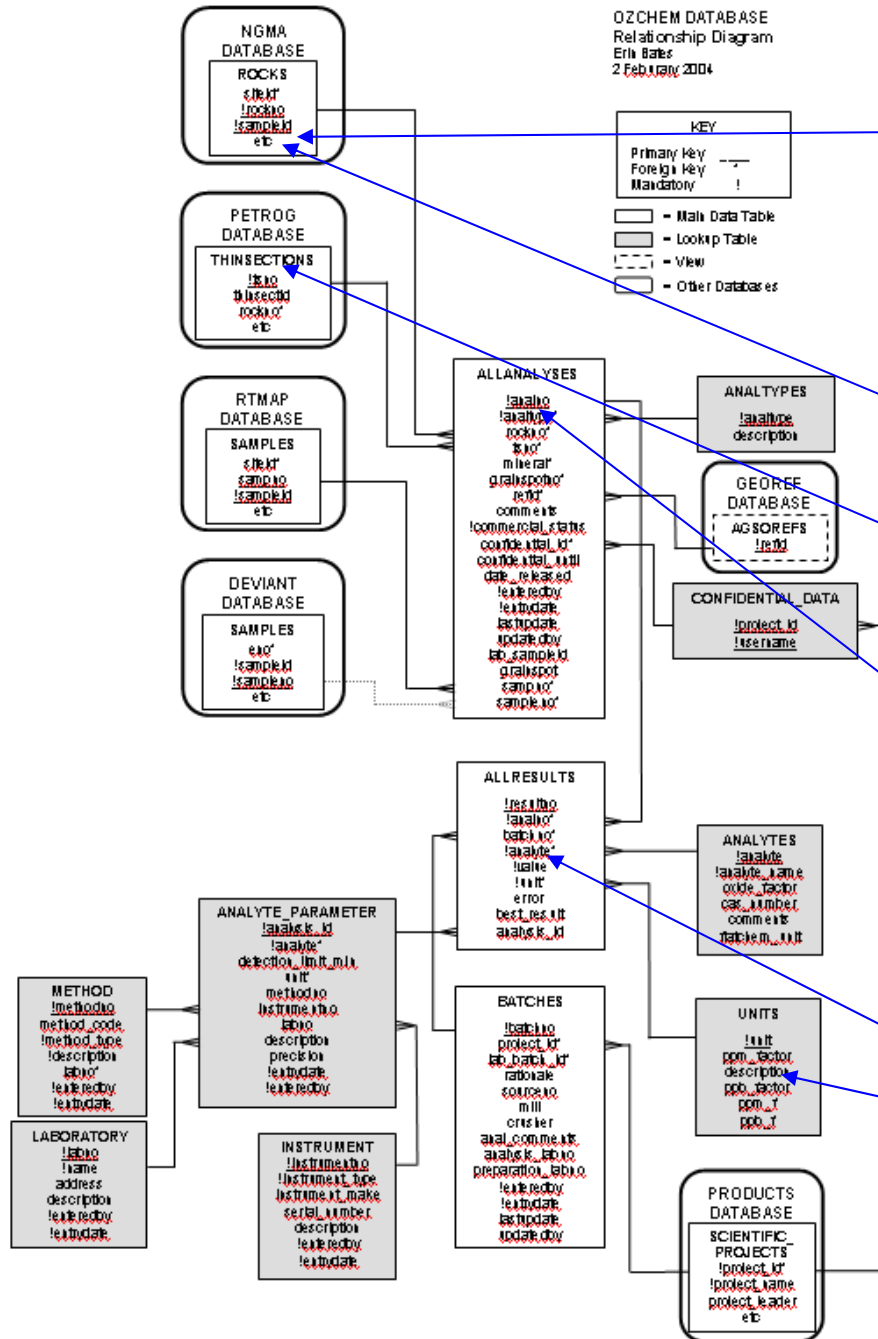
# GeoSciML

It is an XML-based data transfer standard for the exchange of digital geological information from a GIS Database.

Seeks to provide a single, open source , globally agreed data structure that is used to deliver digital geological data over the internet.

# your internal database: your storage

# transfer standard: an agreed schema



```

https://cg-cvs.arrc.csiro.au/xmlml/viewcvs.cgi/*checkout*/src/Examples/geochem/surfaceGeochem_s
- <xmlml:projectDetails>
- <xmlml:Project gml:id="KP98_99">
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</xmlml:TimePeriod>
</xmlml:active>
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</xmlml:projectDetails>
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  <gml:name>Kryptonite Project/1998-1999 Drilling Program</gml:name>
- <gml:boundedBy>
- <gml:Envelope srsName="MGAS2">
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  <gml:pos>348978 7719052</gml:pos>
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  <xmlml:component>
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    <gml:name>Gold 1</gml:name>
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  </xmlml:Assay>
</xmlml:component>
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  <xmlml:Assay gml:id="Au2">

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# Semantic Agreement

Need to develop an agreed standards on data content, that is controlled vocabularies by the national/ international geological community.

For controlled vocabulary formulated a document on:

**“Data Content Standard on  
Surface Geological Mapping”**

Under the initiative of NSDI Working Group on Data Content Standard.

# Geological Data Model

- It is a description of the features represented by a computer system together with their properties and relationship.
- A collection of concepts that can be used to describe the structure of a database (data types, relationship and constraints)
- **Basic operations ( retrieval and updates )**
- Specify the dynamic aspects of a database application (user-defined applications)

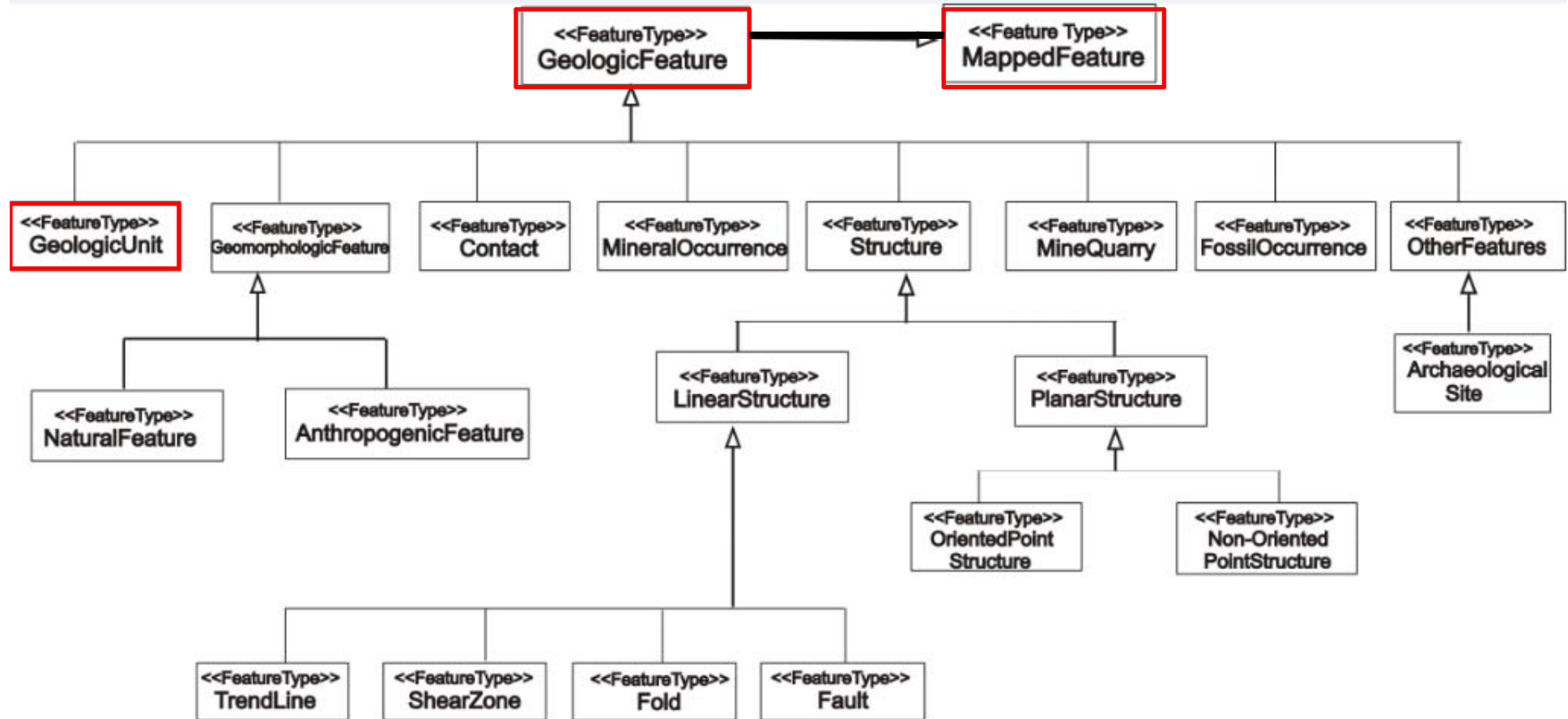
As per ANSI there are three instances of Data model i.e. **Conceptual Data Model, Logical Data Model and Physical Data Model**

# Conceptual Data Model

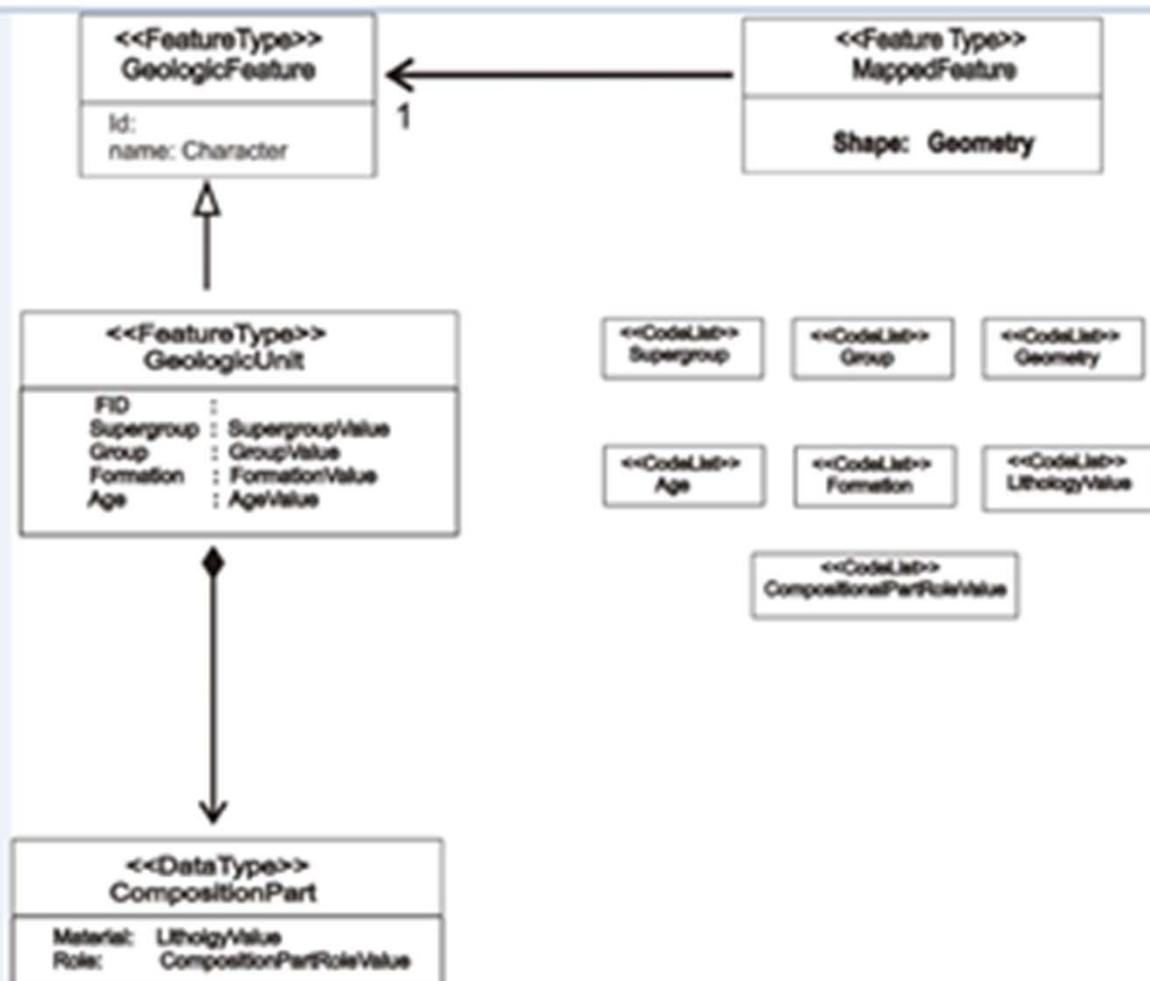
- The Organisation-wide view of the entire database of one domain e.g. surface geological mapping, geochemical, etc.
- Lists all data elements & their relationship between them
- It is the first step before drawing a UML diagram.
- It helps to understand the entities in the real world and how they interact with each other.



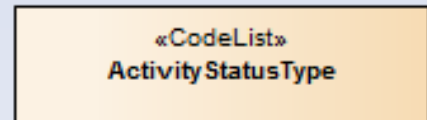
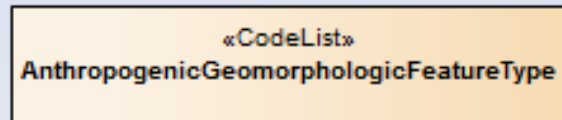
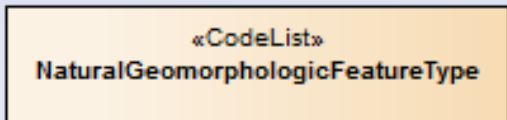
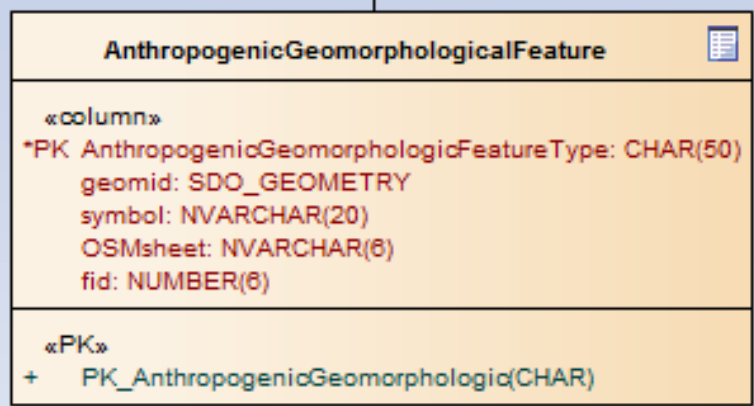
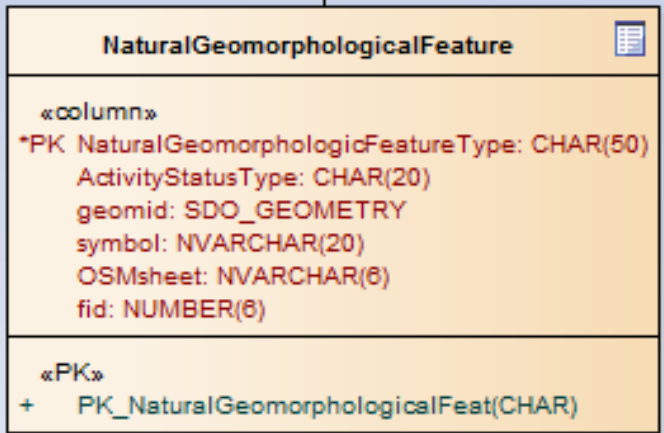
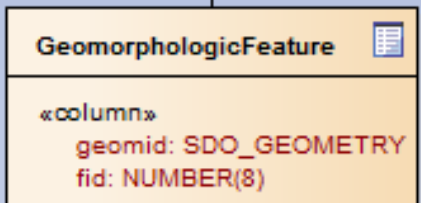
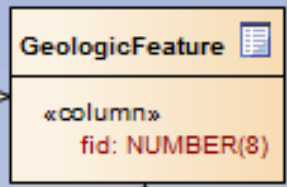
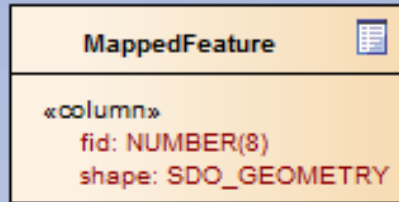
# Conceptual data model for GSI 1:50 K map

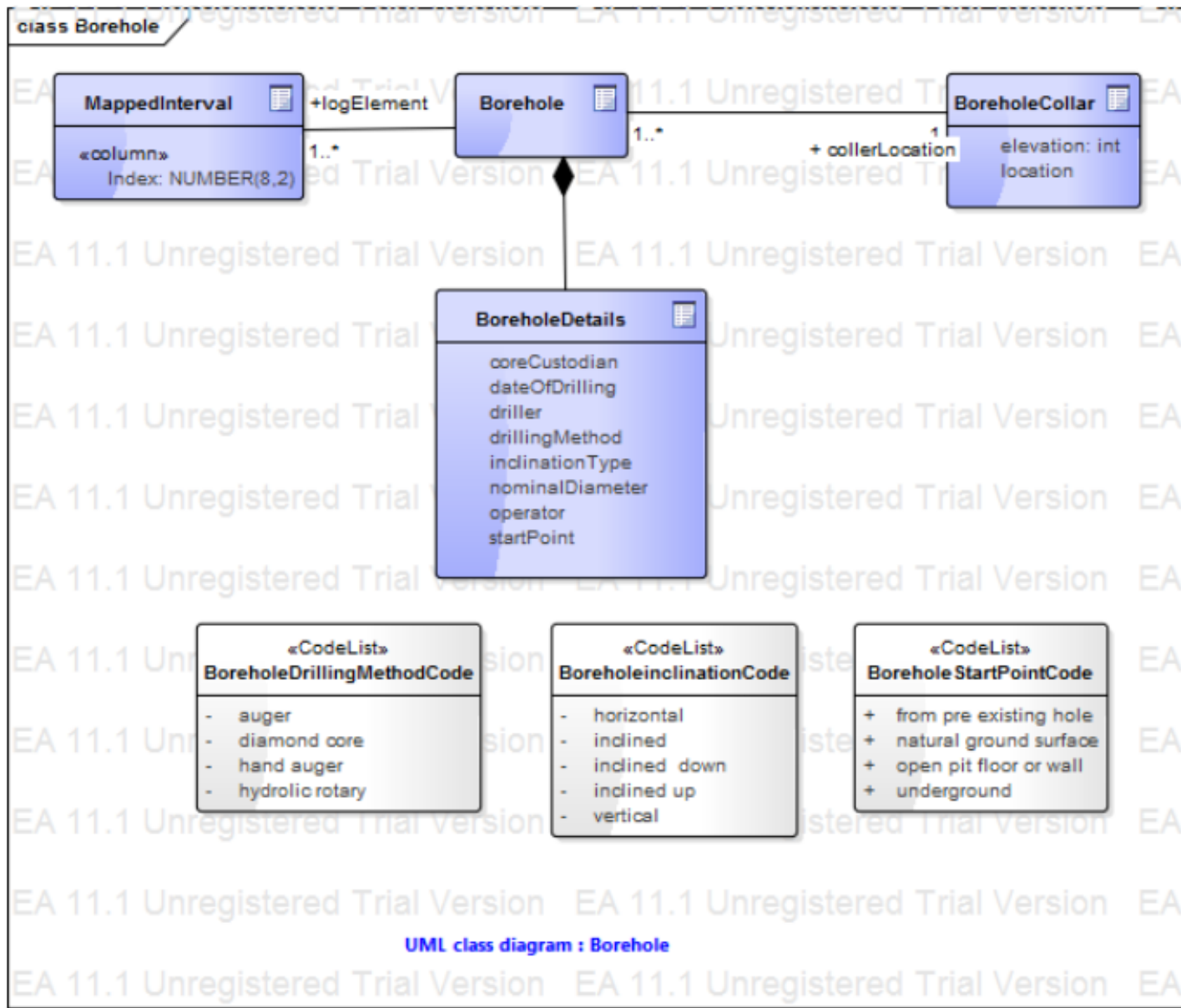


Overview of the GeologyCore Application Schema for 1:50K Map



UML Class diagram: Geology Unit for 1:50K Map







# Logical Data Model

- Modelling geo-spatial data using UML class diagram
- Generating XMI, XSD, Data Definition Language file from UML Class diagram using Enterprise Architect software.

Web Service support only the data types defined in the XSD.

This makes them **interoperable across platforms**, and are ideal for heterogeneous environments.

## GS1 50K DATA RE-ENGINEERING

Digital geological database of **54 B sheet** (16 sheets from 54B01 to 54B16 covering part of Rajasthan), in shape file format was re-engineered to make them GIS processable.

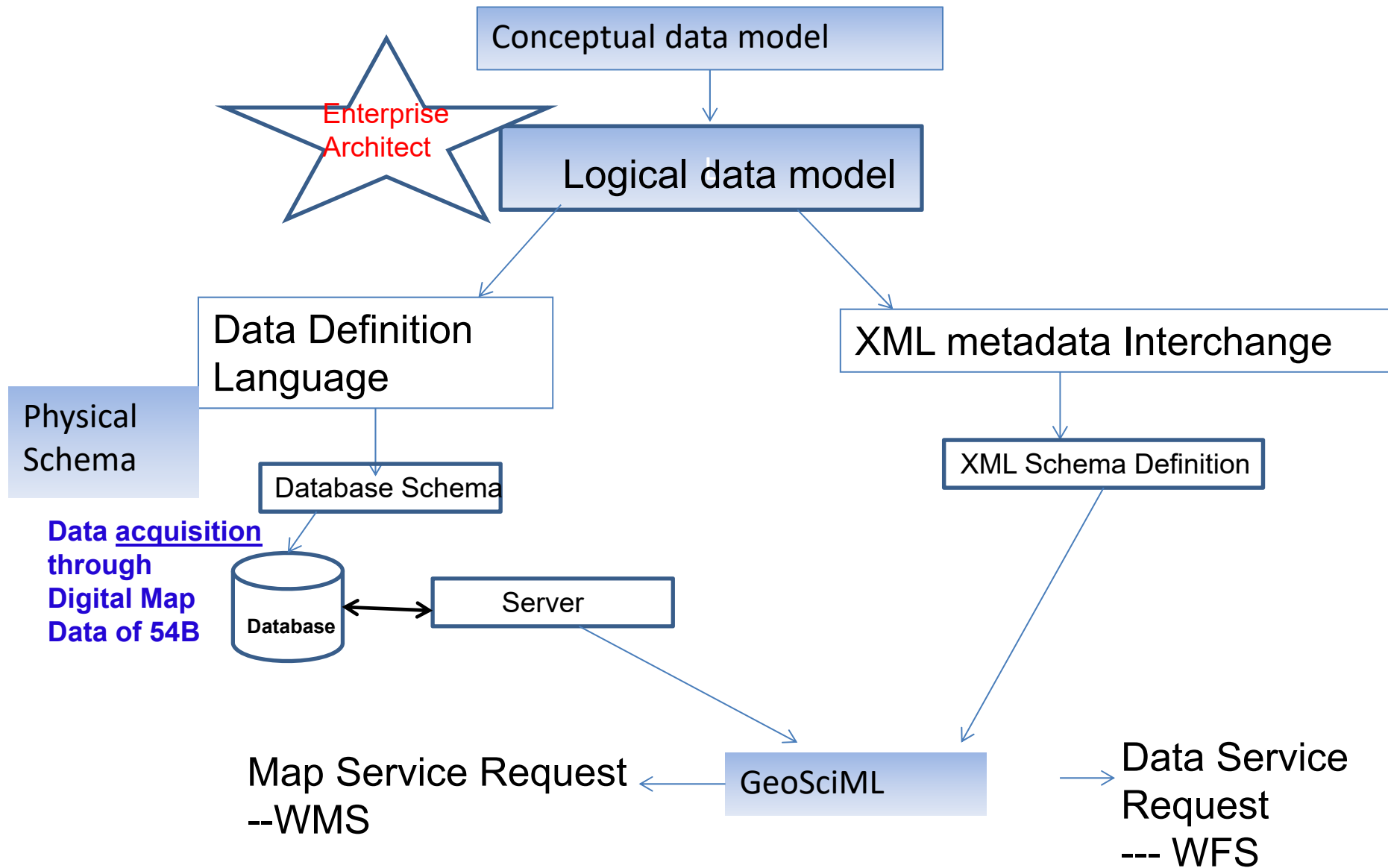
Converted **projected co-ordinates** (UTM projection) of the above dataset to **geographic co-ordinates**.

Created CSV file from the dataset using FME software.

Created and published WMS & WFS services using ERDAS Apollo Software.

This CSV file was uploaded in Oracle Spatial database.

# Flow chart



**Domain specific Schema generation**

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```
</packagedElement>
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    <upperValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000028_948D_4666_8CF7_D53B69C634CF" value="1"/>
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        <xs:element name="FormationValue" type="xs:string" minOccurs="1" maxOccurs="1"/>
        <xs:element name="AgeValue" type="xs:string" minOccurs="1" maxOccurs="1"/>
        <xs:element name="CompositionPart" type="CompositionPart" minOccurs="1" maxOccurs="1"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name="AgeValue" type="AgeValue"/>
<xs:complexType name="AgeValue">
  <xs:sequence>
```

# LOGICAL DATA MODEL TO DATABASE SCHEMA

Generation of **Database Definition Language** from logical data model

**SQL of the class diagram \_ Geologic unit**

```
DROP TABLE AgeValue CASCADE CONSTRAINTS;
DROP TABLE CompositionPart CASCADE CONSTRAINTS;
DROP TABLE FormationValue CASCADE CONSTRAINTS;
DROP TABLE GeologicFeature CASCADE CONSTRAINTS;
DROP TABLE GeologicUnit CASCADE CONSTRAINTS;
DROP TABLE GroupValue CASCADE CONSTRAINTS;
DROP TABLE MappedFeature CASCADE CONSTRAINTS;
DROP TABLE MaterialValue CASCADE CONSTRAINTS;
DROP TABLE RoleValue CASCADE CONSTRAINTS;
DROP TABLE SuperGroupValue CASCADE CONSTRAINTS;

CREATE TABLE AgeValue
(
    id          NUMBER(8,2) NOT NULL,
    description VARCHAR(50)
);

CREATE TABLE CompositionPart
(
    Material VARCHAR(50),
    Role     VARCHAR(50)
);

CREATE TABLE FormationValue
(
    id          NUMBER(8,2) NOT NULL,
    description VARCHAR(50)
);

CREATE TABLE GeologicFeature
(
    id   VARCHAR(50) NOT NULL,
    name VARCHAR(50)
);

CREATE TABLE GeologicUnit
(
```

```
CREATE TABLE GeologicUnit
(
    FID                VARCHAR(50) NOT NULL,
    SupergroupValue    VARCHAR(50),
    GroupValue         VARCHAR(50),
    FormationValue     VARCHAR(50),
    AgeValue           VARCHAR(50)
);

CREATE TABLE GroupValue
(
    id                 NUMBER(8,2) NOT NULL,
    description        VARCHAR(50)
);

CREATE TABLE MappedFeature
(
    Shape              SDO_GEOMETRY
);

CREATE TABLE MaterialValue
(
    id                 NUMBER(8,2) NOT NULL,
    description        VARCHAR(50)
);

CREATE TABLE RoleValue
(
    id                 NUMBER(8,2) NOT NULL,
    description        VARCHAR(50)
);

CREATE TABLE SuperGroupValue
(
    id                 NUMBER(8,2) NOT NULL,
    description        VARCHAR(50)
```



## Generation of Database Schema from Data Definition Language file

The Data Definition Language file is basically a **SQL script file with a .sql extension**. It contains the SQL statement one by one to automate the process of schema generation.

Load the sql schema by following command at Sql prompt:

```
Sql> @ geology.sql
```

Created table, can be viewed by executing the following command:

```
SQL> SELECT * from TAB
```

The database can be populated with the data.

To see table structure:

```
SQL> desc lithology
```

Name	Null?	Type
TOPOSHEET_NO		VARCHAR2(5)
GEOMETRY_ID		NUMBER
AGE		VARCHAR2(40)
SUPERGROUP		VARCHAR2(40)
GROUP		VARCHAR2(40)
FORMATION		VARCHAR2(30)
MEMBER		VARCHAR2(50)
LITHOLOGIC_NAME		VARCHAR2(50)
GEOM_ID	NOT NULL	MDSYS.SDO_GEOMETRY

```
SQL >
```

```
SQL >
```

**Physical  
Data Model**

## Data interoperability using OGC compliant data encoding (GML) and web services

- Integration of geo-databases into a common Enterprise-GIS framework
- Provide required **Application Programming Interface (API)** for easy access and visualization of spatial web-services as and when necessary.

# Accessing Lithology layer from Oracle Spatial database

## Lithology Layer in IITKgp-EGIS

The screenshot displays the IITKgp-EGIS web application interface. The main window shows a map of the lithology layer, which is a yellow map with black contour lines. The map is overlaid with a grid. The application title is "IIT KHARAGPUR : ENTERPRISE GIS".

On the left side, there is a metadata panel with the following information:

- north: 27 00041273
- west: 75 99999960
- south: 25 99999942
- east: 77 00000322
- url: 300x
- Scale: 1:653217

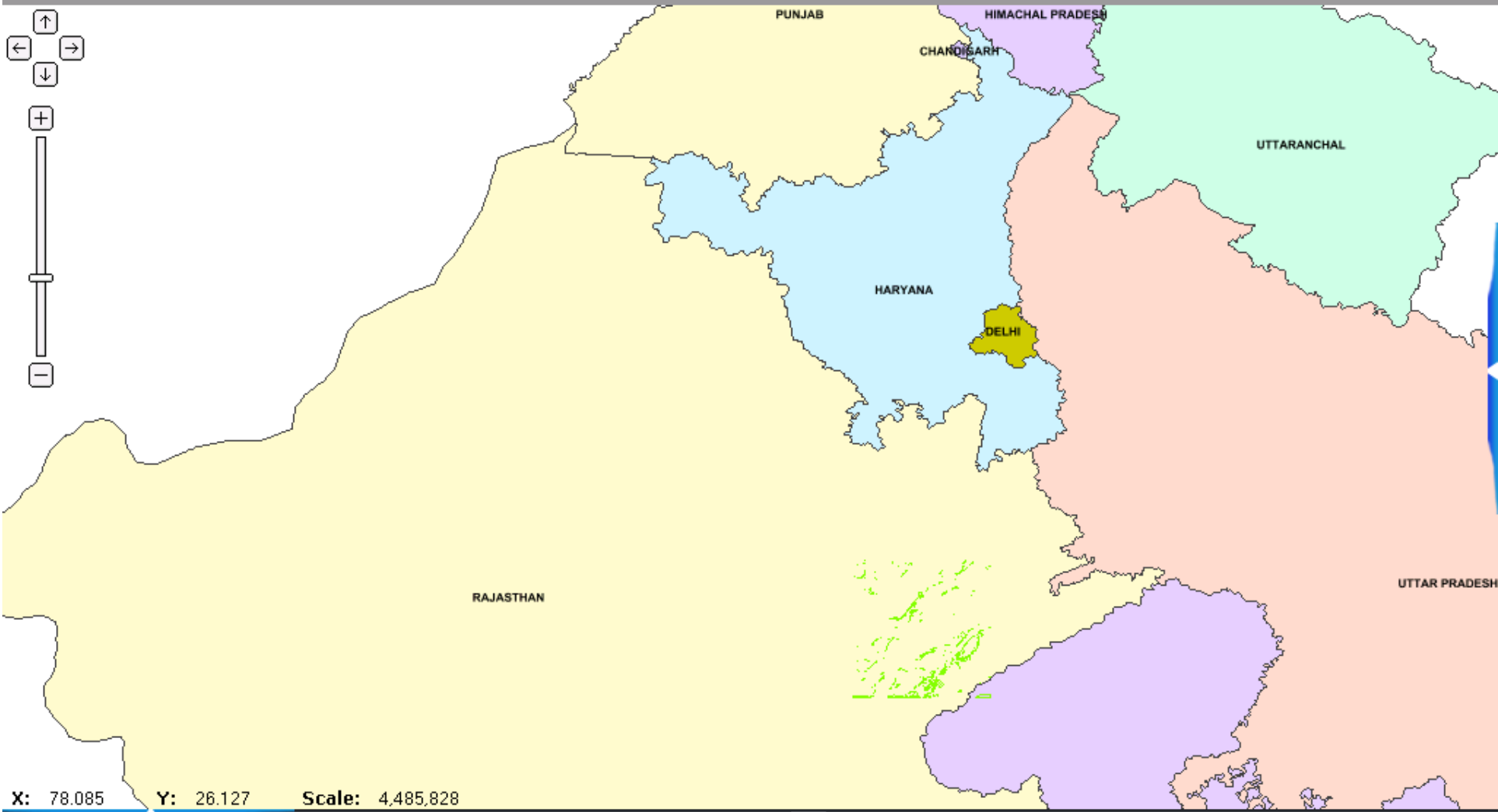
On the right side, there is a "Theme selection" panel with a dropdown menu set to "LITHOLOGY". Below it, there is a "LayerList/View" panel showing the "NSD/GSI" layer, which is expanded to show "IIT KGP GEOSERVICE" and "lithology".

At the bottom of the application, there is a footer with the text "www\_lithology.zip", "lithology.zip", and "lithology.zip".

```

<gml:featureMember>
  - <app:lithology gml:id="ID_1">
    - <gml:boundedBy>
      - <gml:Envelope srsName="EPSG:4326">
        <gml:pos srsDimension="2">76.5088347368643 26.3064862210783</gml:pos>
        <gml:pos srsDimension="2">76.5099485130937 26.307624465746</gml:pos>
      </gml:Envelope>
    </gml:boundedBy>
    - <app:geometry>
      - <gml:Polygon srsName="EPSG:4326">
        - <gml:outerBoundaryIs>
          - <gml:LinearRing>
            <gml:coordinates ts=" " decimal="." cs=",">76.5098117130929,26.3065367985243 76.5099178850522,26.3066172081884
              76.5099408198869,26.3067360568321 76.5099485130937,26.3068571591313 76.5099106864842,26.3070030435269
              76.5098422157685,26.3071448657687 76.5096742683644,26.307393501485 76.5095900218153,26.3074516952408
              76.5094831563266,26.3075101391652 76.5093462366057,26.3076107572976 76.5090866023343,26.307624465746
              76.5089568707081,26.307570781286 76.5088655607873,26.3074152345391 76.5088347368643,26.3072546454398
              76.5088423635293,26.3070826376802 76.5088653145975,26.3069677388716 76.5089266277599,26.306843707338
              76.5090331926514,26.3067103161826 76.5092088333164,26.3065806424274 76.5094071732822,26.3065080133661
              76.5095903613115,26.3064862210783 76.5098117130929,26.3065367985243</gml:coordinates>
          </gml:LinearRing>
        </gml:outerBoundaryIs>
      </gml:Polygon>
    </app:geometry>
    <app:toposheet_>54B11</app:toposheet_>
    <app:geometry_i>972000</app:geometry_i>
    <app:age>PALAEOPROTEROZOIC</app:age>
    <app:supergroup>BHILWARA</app:supergroup>
    <app:group_name>RANTHAMBHOR</app:group_name>
    <app:formation>BARI SADRI</app:formation>
    <app:lithologic>QUARTZITE WITH SLATE/PHYLLITE/SCHIST</app:lithologic>
    <app:name>Lithology</app:name>
  </app:lithology>
</gml:featureMember>

```





File Edit View History Bookmarks Tools Help

@gov.in NSDI Client

https://nsdindia.gov.in/nsdi-portal/index.jsp air india

Most Visited Getting Started Latest Headlines Welcome to NSDI Geo...

Nodal About Help Logout

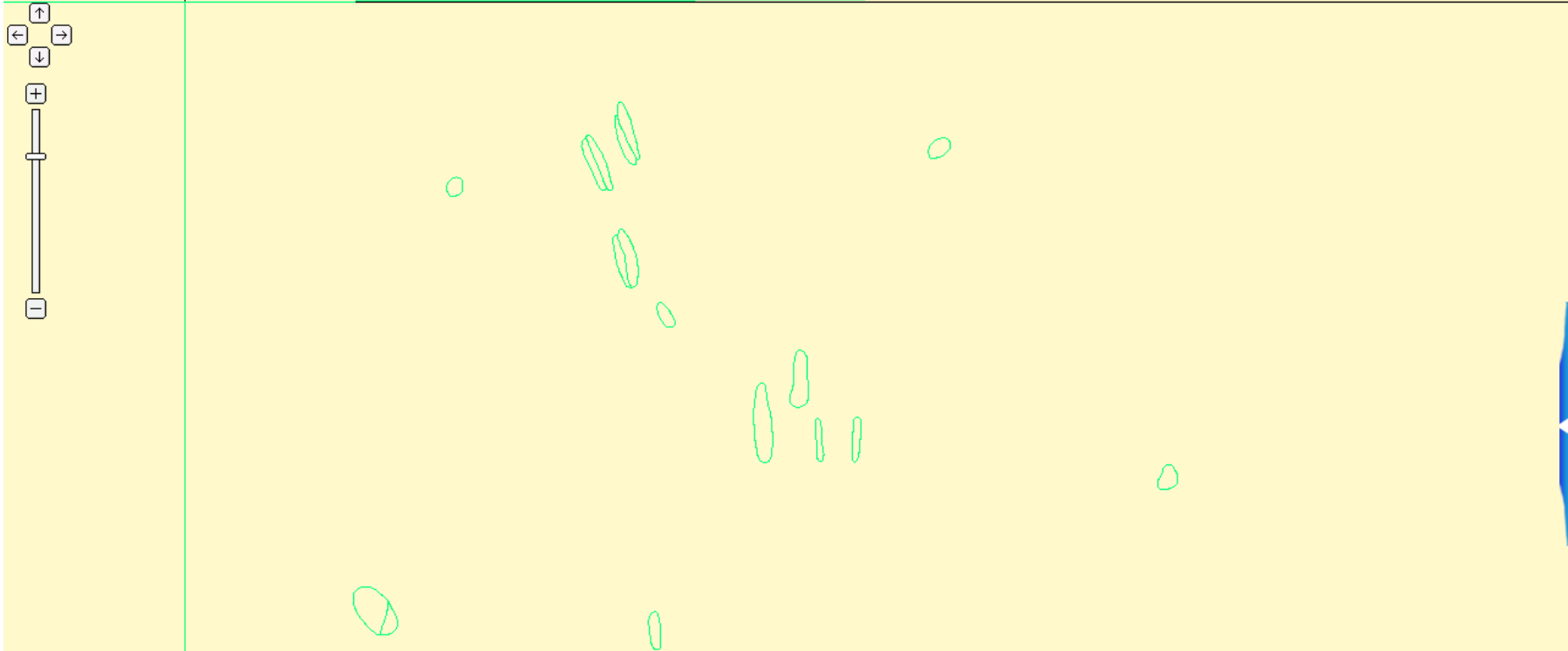
# nsdi National Spatial Data Infrastr...

X: 77.289 Y: 25.918 Scale: 871.652

Layers Metadata Discover Data Tools Search

- BHUVAN-satellite
- Li\_54B
- BoundariesMH
- ContourMH
- HabitationMH
- HydrographyMH
- LandcoverMH
- RailwayMH
- RoadsMH
- UtilitiesMH
- BoundariesAPradesh
- ContourAPradesh
- HabitationAPradesh

start NSDI Client - Mozilla F... ScreenComms Kamvisdar .doc - Micr... Microsoft PowerPoint ... 2:49 PM



**Li\_54B**

ID	description	name	boundedBy	INPUT_CENT	TOPOSHEET_	EDITION_NU	GEOMETRY_1	AGE	SUPERGROUP	GROUP_NAME	FORMATION
Li_54B.137				JAI	54B05	1	968800	ARCHAEAN	BHILWARA	MANGALWAR	MANGALWAR UNC
Li_54B.699				JAI	54B05	1	969900	ARCHAEAN	UNDEFINED	UNDEFINED	INTRUSIVE85
Li_54B.610				JAI	54B05	1	998300	QUATERNARY	UNDEFINED	UNDEFINED	QUATERNARY (UN
Li_54B.749				JAI	54B05	1	968800	ARCHAEAN	BHILWARA	MANGALWAR	MANGALWAR UNC
Li_54B.839				JAI	54B05	1	969900	ARCHAEAN	UNDEFINED	UNDEFINED	INTRUSIVE85

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File Edit View History Bookmarks Tools Help

@gov.in NSDI Client

https://nsdiindia.gov.in/nsdi-portal/index.jsp

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Nodal About Help Logout

# nsdi National Spatial Data Infrastr...

Layers Metadata Discover **Data** Tools Search

Download Data Upload Data

Select Layer: **GEOLOGICUNIT**

Format: **GML**

Submit

**Opening 64d40f37ca9fdffa53ea20b9d771fd44.zip**

You have chosen to open:

**64d40f37ca9fdffa53ea20b9d771fd44.zip**  
 which is: WinZip File  
 from: https://nsdiindia.gov.in

What should Firefox do with this file?

Open with WinZip Executable (default)

Save File

Do this automatically for files like this from now on.

OK Cancel

**GEOLOGICUNIT**

name	boundedBy	POLYGON_ID	TOPOSHEET	GEOMETRY_I	AGE	SUPERGROUPVA	GROUPVALUE
		43	54B05	969900	ARCHAEAN	UNDEFINED	UNDEFINED
		568	54B05	969900	ARCHAEAN	UNDEFINED	UNDEFINED
		569	54B05	968800	ARCHAEAN	BHILWARA	MANGALWAR
		67	54B05	969900	ARCHAEAN	UNDEFINED	UNDEFINED
		141	54B05	968800	ARCHAEAN	BHILWARA	MANGALWAR

Page 1 of 1

start

NSDI Client - Mozilla F... IBM\_PRELOAD (C:) Microsoft PowerPoint ... Microsoft Word

5:43 PM

# **DATA REGISTRY**

METADATA CATALOG SERVICES (MCS) USING OPEN  
SOURCE  
GEONETWORK SOFTWARE



# How MCS (Metadata Catalog System) Looks?

Portal Home- Customizable

The screenshot displays the GeoNetwork Metadata Catalog System interface within a Mozilla Firefox browser window. The browser's address bar shows the URL `192.168.1.99:8181/geoportal/srv/eng/main.home`. The page header features the Geological Survey of India logo and the text "Geological Survey of India" and "Metadata Catalog Services". A navigation menu includes links for "Home", "Administration", "Contact us", "Links", "About", and "Help". The user is logged in as "admin admin".

The main interface is divided into several sections:

- Search:** Includes "Simple Search" and "Advanced Search" tabs. A "WHAT?" search box is present, along with a "WHERE?" section featuring a map thumbnail and a "Search" button. A "Reset" and "Options" link is also visible.
- Map viewer:** A large map of the world is displayed. The "Layer tree" on the left shows a "Base Layer" and several "Overlays", all of which are checked. A "Legend" button is located at the bottom left of the map viewer.
- Map controls:** A toolbar above the map includes navigation icons (pan, zoom, home, etc.) and a coordinate display showing "Y10384 (lat lon)". A scale bar at the bottom right indicates "2000 km" and "3000 mi" with a scale of "1: 2500000".

The Windows taskbar at the bottom shows various application icons and the system clock indicating "2:52 PM 2/4/2013".



## METADATA CATALOG SERVICES

1. Online editing of metadata with a powerful template system
2. Scheduled harvesting
3. Supports OGC-CSW 2.0.2 and Z39.50 protocols.
4. Metadata standards involved: ISO 19115, 19119, 19110, FGDC , Dublin core.
5. Geonetwork to Geonetwork harvesting support
6. Platform independent: Run the software on PC or a server on a window or Linux.

## METADATA CATALOG SERVICES

- Metadata Services
  - MetaData Search Services
  - View MetaData
- MetaData Management services
  - Insert MetaData
  - Edit Metadata
  - Delete MetaData
  - Export MetaData
  - Import MetaData
  - Generate XML MetaData
  - Batch Upload MetaData

### **Administrative Services:**

User Group Management and User Access Management

# NSDI SCHEMA

```
<?xml version="1.0" encoding="UTF-8"?>
- <xs:schema version="0.1" elementFormDefault="qualified" targetNamespace="http://www.isotc211.org/2005/gmd" xmlns:gmd="http://www.isotc211.org/2005/gmd"
  xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <!-- ===== Annotation ===== -->
- <xs:annotation>
  <xs:documentation>This file was generated from ISO TC/211 UML class diagrams == 01-26-2005 12:40:01 ===== </xs:documentation>
</xs:annotation>
  <!-- ===== Imports ===== -->
<xs:import schemaLocation="./gco/gco.xsd" namespace="http://www.isotc211.org/2005/gco"/>
  <!-- ===== -->
  <!-- ===== -->
  <!-- ===== Classes ===== -->
- <xs:complexType name="MD_NSDI_Identification_Type">
- <xs:annotation>
  <xs:documentation>Restrictions on the access and use of a dataset or metadata</xs:documentation>
</xs:annotation>
- <xs:complexContent>
- <xs:extension base="gco:AbstractObject_Type">
- <xs:sequence>
  <xs:element name="id" type="gco:CharacterString_PropertyType"/>
  <xs:element name="Name_of_Dataset" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Name_of_data" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Theme" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Keywords" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Access_Constraints" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Use_Constraints" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Purpose_of_creating_Data" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Data_Type" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Agency_Id" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  <xs:element name="Agency_Name" type="gco:CharacterString_PropertyType" minOccurs="0"/>
  </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
  <!-- ----- -->
<xs:element name="MD_NSDI_Identification_Type" type="gmd:MD_NSDI_Identification_Type"/>
```

# METADATA SEARCH

- Keyword search
- Free form text /string search
- Metadata Domain Search (Specific to GSI)
- OSM Sheet Search- Specific topographic sheet can be select as search criteria
- Geo-coordinate based search criteria- MCS provides an interactive map to select latitude and longitude as Geo bound to search metadata for selected Geographic regions



## DATA INSERT

- **Metadata Insert in MCS-**
  - MCS support online data insertion by end users with help of a User friendly Graphic User Interface (GUI)
  - Data can get directly uploaded in MCS from excel files defined in a specific format
    - MCS checks the valid file before uploading data. If any file format is invalid MCS will generate a warning message
    - MCS convert Excel file in XML format before uploading
    - MCS checks the metadata record format before uploading. If any record format is invalid MCS will generate a warning message for specific fields.
    - A log file can also viewed for the reference purpose

- Default view
- By Package
- Identification
- Contact Information
- Citation
- Coverage
- Metadata data stamp
- Dataset topic category
- Language
- Abstract describing the data
- For Image Data
- KML view

[Create](#) [Edit](#) [Delete](#) [Other actions](#)

### DATA IDENTIFICATION INFORMATION

ID	gsi50KFault1978-1
Name of the Dataset	Map50K-Fault
Name of the Data	Map50K-Fault-1978-1 43L4
Theme	Geology
Keywords	1:50K,Fault,GSI
Access Constraints	As per GSI Data Dissemination Policy
Use Constraints	As per GSI Data Dissemination Policy
Purpose of Creating Data	To generate digital geological database
Data Type	Vector
Agency Id	2

#### Agency\_Name

Text: Geological Survey of India

### CITATION

Data Prepared by	Geological Survey of India
Original Source	1:50K Geological Map
Source Scale and Date	1:50K
Mapping year	1978
Digitizing year	2010
Survey year	1962
Lineage	1 43L4
Associated Project preparing the data	NA
Associated Publications	NA



# GSI METADATA ON NSDI PORTAL

The screenshot shows the NSDI India GeoPortal website. The browser address bar displays <https://nsdiindia.gov.in/nsdi-portal/index.jsp>. The page features a navigation menu with options: Layers, Metadata, Discover, Data, Tools, and Search. The 'Metadata' tab is active, and the 'Spatial' sub-tab is selected.

The main content area displays the 'NSDI Metadata' window, which includes a table for 'Data Identification Information' and a list of metadata entries.

Name	Value
NAME_OF_DATASET	Map50K-Boundary
NAME_OF_DATA	Map50K-Boundary-1968-F 42C/5
THEME	Geology
KEYWORDS	1:50K, Boundary, GSI
ACCESS_CONSTRAINTS	As per GSI Data Dissemination Policy
USE_CONSTRAINTS	As per GSI Data Dissemination Policy
PURPOSE_of_creating_Data	To generate digital geological database
DATA_TYPE	Vector
AGENCY_NAME	Geological Survey of India
AGENCY_ID	2.0

Below the table, there are fields for Longitude (74.9718246, 27.4862819), Latitude (75.9256593, 28.0221441), and Map Code (G 43D/5). A 'Drag On Map' button is also present.

The 'Selected Agency' is Geological Survey of India, and the 'Selected Product' is Geological Survey of India. There are 'Submit' and 'Reset' buttons, along with a 'Dependency Note : Please Ensure Mapsheet services are available.'

At the bottom, there is a search bar and a table listing metadata entries:

Layer Name	Layer Description	Metadata
Map50K-Boundary-1968-F 42C/5	As per GSI Data Dissemination Policy	Get Metadata
Map50K-Lithology-1968-F 42C/5	As per GSI Data Dissemination Policy	Get Metadata

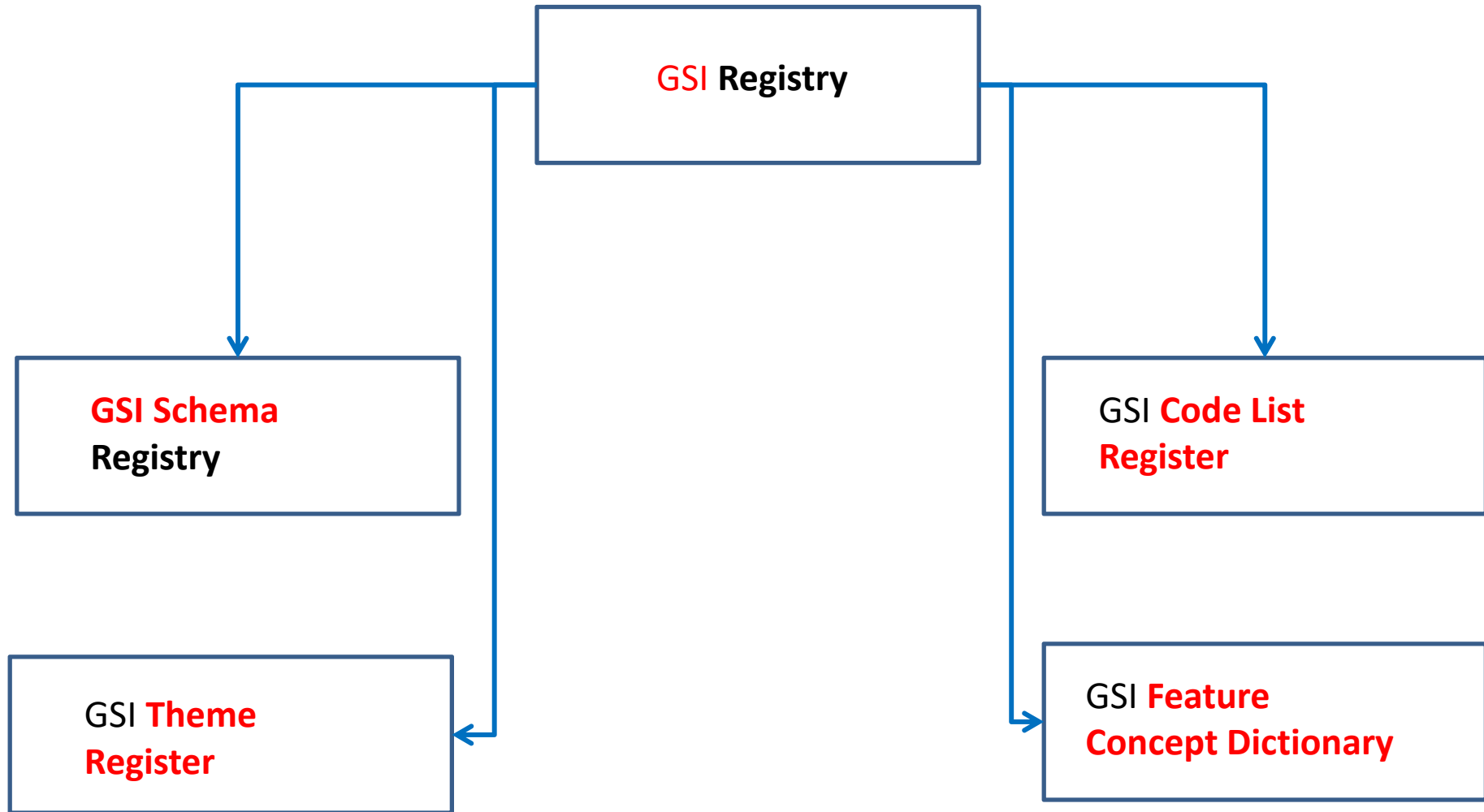
Showing 1 to 2 of 2 entries. Navigation buttons: First, Previous, 1, Next, Last.

## GSI registry

The GSI involves a number of items, which require clear descriptions and the possibility to be referenced through unique identifiers. Such items include GSI theme register, code list register, application schemas register feature concept dictionary. **Registers provide a means to assign identifiers to items and their labels and descriptions.**

SN	Label
1	GSI theme register
2	GSI code list register
3	GSI feature concept dictionary
4	GSI application schema register

# The GSI Registry



# GEOLOGICAL DATA CONTENT STANDARD

---

In the 1:50 K geological map of India there are:

1. 19 Supergroups
2. 167 Groups
3. 1087 Formations
4. Geological age

**Boreholes** are another important source of information for interpreting the subsurface geology.

The **geomorphologic features** are often indicated on general geological maps, and are detailed on specific, applied geomorphological map

## GSI code list register

ID: <http://portal.gsi.gov.in /codelist>

Language: **en**

Label: **GSI code list register**

Owner: **GSI**

Content Summary:

The code list register contains the code lists and their values, as defined in the implementing rules on interoperability of spatial data sets and services

Registry: [GSI registry](#)

## Code list

<b>Lable</b>	<b>Parent</b>	<b>Status</b>
<a href="#">allostratigraphic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">alteration unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
biostratigraphic unit	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">chronostratigraphic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">deformation unit</a>	<a href="#">lithotectonic unit</a>	<a href="#">Valid</a>
<a href="#">excavation unit</a>	<a href="#">lithogenetic unit</a>	<a href="#">Valid</a>
<a href="#">geologic unit</a>		<a href="#">Valid</a>
<a href="#">geophysical unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">lithodemic unit</a>	<a href="#">lithostratigraphic unit</a>	<a href="#">Valid</a>
<a href="#">lithogenetic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">lithologic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">lithostratigraphic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">lithotectonic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">mass movement unit</a>	<a href="#">lithogenetic unit</a>	<a href="#">Valid</a>
<a href="#">pedostratigraphic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
<a href="#">polarity chronostratigraphic unit</a>	<a href="#">geologic unit</a>	<a href="#">Valid</a>
Geochronologic era	<a href="#">geologic unit</a>	Valid



## **biostratigraphic unit**

ID: <http://portal.gsi.gov.in/codelist/GeologicUnitTypeValue/biostratigraphicUnit>

Item class: **Code list value**

Language: **en**

Label: **biostratigraphic unit**

Definition: Geologic unit defined based on fossil content.

Status: [Valid](#)

Parent: [geologic unit](#)

Registry: [GSI registry](#)

Register: [GSI code list register](#)

Theme: [Geology](#)

Application schema: [Geology](#)

Code list: [Geologic Unit Type](#)

## Chronostratigraphic unit

ID:<http://portal.gsi.gov.in/codelist/GeologicUnitTypeValue/chronostratigraphicUnit>

Item class:**Code list value**

Language:**en**

Label:**chronostratigraphic unit**

Definition: Geologic unit that includes all rocks formed during a specific interval of geologic time

Status:[Valid](#)

Parent:[geologic unit](#)

Registry:[GSI registry](#)

Register:[GSI code list register](#)

Theme:[Geology](#)

Application schema: [Geology](#)

Code list:[Geologic Unit Type](#)

## Geochronologic Era

ID: <http://portal.gsi.gov.in/codelist/GeochronologicEraValue>

Item class: **Code list**

Language: **en**

Label: **Geochronologic Era**

Definition:

Terms specifying recognised geological time units.

Status: [Valid](#)

Registry: [GSI registry](#)

Register: [GSI code list register](#)

Theme: [Geology](#)

## Code list Geomorphology

<b>SN</b>	<b>Geomorphic feature</b>
1	Abandoned meander
2	Abandoned Meander Channel.
3	Aeolian landforms
4	Alluvial Cone
5	Alluvial fan
6	Alluvial plain
7	Atoll
8	Badlands
9	Bajada
10	Bar
11	Barchans
12	Barchan dune
13	Basin
14	Beach
15	Blind valley
16	Braided stream
17	Butte

# Feature concept dictionary

Label	Theme	Status
<a href="#">Exploration Activity</a>	<a href="#">Mineral Resources</a>	<a href="#">Valid</a>
<a href="#">Exposed Element</a>	<a href="#">Natural Risk Zones</a>	<a href="#">Valid</a>
<a href="#">Exposed Element Coverage</a>	<a href="#">Natural Risk Zones</a>	<a href="#">Valid</a>
<a href="#">Fold</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Fossil Fuel Resource</a>	<a href="#">Energy Resources</a>	<a href="#">Valid</a>
<a href="#">Geologic Collection</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Geologic Event</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Geologic Feature</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Geologic Structure</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Geologic Unit</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Geomorphologic Feature</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Hazard Area</a>	<a href="#">Natural Risk Zones</a>	<a href="#">Valid</a>
<a href="#">Hazard Coverage</a>	<a href="#">Natural Risk Zones</a>	<a href="#">Valid</a>
<a href="#">Hydrogeological Object</a>	<a href="#">Geology</a>	<a href="#">Valid</a>
<a href="#">Hydrogeological Unit</a>	<a href="#">Geology</a>	<a href="#">Valid</a>

# **Fold**

ID:

<http://portal.gsi.gov.in/featureconcept/Fold>

Item class: **Feature concept**

Language: **en**

Label: **Fold**

UML class name: **Fold**

Definition: One or more systematically curved layers, in a rock body.

Status: [Valid](#)

Registry: GSI Registry

Register: [GSI feature concept dictionary](#)

Theme: [Geology](#)



## **Geologic Structure**

ID: <http://portal.gsi.gov.in/featureconcept/GeologicStructure>

Item class: **Feature concept**

Language: **en**

Label: **Geologic Structure**

UML class name: GeologicStructure

Definition: A configuration of matter in the Earth based on describable inhomogeneity, pattern or fracture in an earth material.

Status: [Valid](#)

Registry: [GSIregistry](#)

Register: [GSI feature concept dictionary](#)

Theme: [Geology](#)

## GSI theme register (other themes)

Theme : **Natural Mineral Resources**

Definition:

Mineral resources including metal ores, industrial minerals, etc., where relevant including depth/height information on the extent of the resource.

Description:

It refers to the description of natural concentrations of very diverse mineral resources of potential or proven economic interest. The important attributes are nature, genesis, location, extent, mining and distribution of resources.

It deals with the:

1. Management of resources and their exploitation and exploration activities:
2. Provision of information on inventoried mineral resources as well as on the quantitative assessment of undiscovered mineral resources and the modelling of mineral deposits.

The Mineral resources [data model](#) deals with the description and location of “earth resources” including their classification, resource estimation.

Theme: **Energy Resources**

Definition:

Energy resources including hydrocarbons, hydropower, bio-energy, solar, wind, etc., where relevant including depth/height information on the extent of the resource.

Description:

Energy Resources in GSI covers historic, current and future energy resources and the entire lifecycle of energy resources, irrespective of its viability in terms of economic, social and technological aspects. It takes into account resources that are depleted due to exploitation in the past and resources currently not viable but may become so in the future.

The concept of energy resources provides focus to the resource aspect and the extent/distribution of the resources. **Fossil fuel resources** include oil accumulation, natural gas accumulations, coal, lignite or peat deposits and Uranium ore deposits. Geothermal energy the natural heat flow is of high interest as a renewable and clean energy source.

Theme: **Geochemical Mapping**

Definition:

Geochemical mapping as an aid to mineral exploration, soil fertility assessment, human and animal health, establishing valid environmental baseline and understanding the chemistry of the environment.

Description

Geochemical mapping serves at generating base line geochemical database through 1:50,000 scale survey. This will enable identifying primary and secondary dispersion pattern as well as possible pay off zones of hidden or deep-seated mineralised areas. Sampling is being carried out with 1: 50,000 Sol toposheet as the base map. These samples are being analyzed for 59 **elements** using 'Clarke' as the lower level of detection.

Theme : **Geophysical Mapping**

## Definition:

Geophysical Mapping activity is for search of minerals / coal especially in concealed terrain and identification of subsurface features. Apart from these also deals with studies on environment and ecology, glacial mass balance, geotechnical problems, seismotectonics studies, active fault mapping, and studies on urban development.

## Description:

The surveys is being conducted for data acquisition employing resistivity and induced polarization methods, magnetic and gamma ray spectrometric techniques. The interpreted maps are aimed at adding information to geological maps and for prospecting and exploration for minerals.

Theme: **Natural Risk Zones**

Definition:

Vulnerable areas characterised according to natural hazards (all atmospheric, hydrologic, seismic, volcanic and wildfire phenomena that, because of their location, severity, and frequency, have the potential to seriously affect society), e.g. floods, landslides and subsidence, avalanches, forest fires, earthquakes, volcanic eruptions.

Description:

Geological hazards are natural earth processes or phenomena that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Geological hazard includes internal earth processes or tectonic origin, such as earthquakes, geological fault activity, tsunamis, volcanic activity and emissions as well as external processes such as mass movements: landslides, rockslides, rock falls or avalanches, surfaces collapses, expansive soils and debris or mud flows. Geological hazards can be single, sequential or combined in their origin and effects .

**Stratigraphy:** The order, in terms of geologic age, of a group of related geologic units. Each geologic map has the stratigraphy for that area shown in the map legend.

**Lithostratigraphic units:** They are defined by observable physical characteristics of rock types which can usually be identified in the field. These form the practical units employed in systematic geologic work that serve as the basis for detailed studies of lithology, local and regional structures, stratigraphy and economic resources.

**Hierarchy of lithostratigraphic units:** A classification system that it gives to areas of related rocks (from the most general to the most specific: Supergroup, Group, Formation, Member, Bed). Each hierarchy level divides the related rocks of a particular area into less complex areas.

**Supergroup:** An assemblage of naturally related groups, or associated groups and formations constitute supergroup. Example: Cuddapah Supergroup, Vindhyan Supergroup.

**Group:** An assemblage of two or more successive and naturally related or associated formations, and is higher in rank than a formation. Group is recognised for the purpose of expressing the natural relations of associated formations. In contrast to formation and member, a group consists wholly of divisions defined as formations. In certain areas stratigraphers have named and defined assemblages of formations within already established useful groups and have designated such assemblages as subgroups.



**Formation:** It is characterised by a typical lithologic association' and homogeneity. It might include (i) a single rock type, e.g., predominantly sandstone, (ii) repetition of two or more rock types, e.g., sandstone, shale and coal.

**Faults:** The map depiction of a place where the Earth's surface has been broken and then moved by the forces of nature. A fault shows the approximate location of the line of breakage and the angle down from horizontal of the plane along which the adjoining broken parts of the earth moved against each other.

**Folds:** The map depiction of a place where the Earth's surface has been compressed and folded, but not broken (like pushing on the edge of a piece of cloth produces folds in the cloth) by the forces of nature. A fold shows the approximate location and the angle down from horizontal of the plane that bisects the fold, as well as the general angle that the layers of rock dip away from that plane.

**Geologic age:** The relative age, in millions of years before the present, of a particular rock or group of rocks. The age is determined either by the association of the rocks with particular fossilized remains of plants or animals, or by the radioactive decay of the elements found in the rock's minerals since it was deposited.

**Geologic structure:** The map depiction of any feature that shows the direction and angle down from horizontal of a layer of rock. These structures can show larger crustal disruptions, such as faults and folds, as well as smaller local disruptions, such as fractures and joints.

**Geologic unit:** the name (and associated map label) that is given in the map legend to a particular type of rock or group of rocks. The name can be from any level of the geologic naming hierarchy and is generally associated with a located place name from a Survey of India topographic map.

**Lithology:** The type of rock that is found in a particular place. This name is either general, like igneous, metamorphic, and sedimentary, or a particular name that describes the physical or chemical characteristics of a rock, like gravel, granite, and sandstone.

**Geomorphology:** The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and of the history of geologic changes as recorded by these surface features.

## DEVELOPMENT OF APPLICATIONS USING DIGITAL GEOLOGICAL DATA

### 1. Providing geological data to detect geo-hazards

#### STEPS:

The user selects on a geo-portal the area of interest and searches in a metadata catalogue for geological maps with lithological and structural information.

The user accesses the lithological, structural ( about active fault), borehole and geotechnical data. This information along with geotechnical properties of the soil from soil theme help to delineate the geo-hazard zones.

### 2. Providing geological data to ensure safe disposal of nuclear waste

#### STEPS:

The user selects on a geo-portal the area of interest and searches in a metadata catalogue for geological maps with lithological and structural information.

The user accesses the lithological, structural and borehole data for 3D modelling of the selected area.

3. Looking for deep fractured zones in the basement for Geothermal exploration to tap geothermal energy
4. Looking for limestone rock suitable for cement industry



**THANKS**